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U. S. Patent Office

VOLUME III
GRAPHOPHONE PATENTS
579,595 - 655,225

T 223 P5U66 1278 V. 3 NMAH	<u>A.</u> Amet, E.H., Andion, I.,	No. 580,591; 620,823;
	<u>B.</u> Bardsley, E.E., Bates, P.S., Baynes, F.W., Berliner, E., " " Bettini, G., " " " " Be tzold, A., Blackman, J.N., Boschen, G.W., Brown, J.N.,	592,758; 654,099; 652,710; 637,196; 637,197; 618,390; 635,120; 643,183; 633,226; 654,937; 654,778; 653,654;
	<u>C.</u> Chania, J., Cheney, G.K., " " " " " " Clark, A.C., Clark & Johnson, Conn, C.G., Cridge, W.W., Crowell, J.H.,	631,558; 609,791; 640,367; 641,578; 655,195; 597,875; 624,625; 624,301; 634,326; 650,526;
	<u>D.</u> Dennis, T.L., Jr., Douglass, L.F.,	590,643; 613,670; 630,869;
	<u>E.</u> Edison, T.A., " " " " " " " " " " " " " " Evard, J.E.,	605,667; 607,588; 609,268; 610,706; 622,843; 648,935; 652,457; 648,659;
	<u>F.</u> Ferguson, A.C., " "	595,053; 653,667
	<u>G.</u> Geneux, E.C., Grelet & Vives, Gress, G.V., Hagen, H. J.,	651,843; 649,725; 655,225; 614,168;
	<u>H.</u> Harmon, O.S., Hart, W., " " " " Hogan, G.L., Hogan, H. J. Holm, P.H.,	606,209; 644,981; 648,406; 651,308; 632,015; 614,168; 629,963;



I.

<u>J.</u>	Johnson, E.R.,	601,198;
	"	634,944;
	"	650,843;
	"	651,076;
	Jones, H.,	628,810;
	"	628,811;
	"	628,812;
	"	628,813;
	Jones, Jos. W.,	600,315;
	"	602,453;
	"	604,829;
	"	605,484;

<u>K.</u>	Kaisling, W.,	581,728;
	Kemp, J.W.,	621,821;
	Kumberg, J.E.O.,	636,209;

<u>L.</u>	Lambert, T.B.,	643,418;
	"	643,419;
	"	645,920;

<u>M.</u>	Macdonald, T.H.,	579,595;
	"	582,754;
	"	587,265;
	"	606,725;
	"	621,834;
	"	624,059;
	"	626,709;
	"	636,822;
	"	654,317;
	Merriman, E.B.,	622,379;
	Minier, D.L.,	650,409;
	Mobley, E.H.,	648,975;
	Montgomery, H.S.,	652,800;
	Myers, F.,	647,147;

Macdonald

647,503

(last part in this volume)

<u>N.</u>	Nolte, F.W.,	646,370;
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<u>O.</u>	Oertly, J.,	650,188;
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<u>P.</u>	Parvin, T.S.,	625,957;
	Payne, O.E.,	654,018;
	Porter, M.D.,	648,994;

Q.

<u>R.</u>	Rosenthal, L.,	638,674;
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<u>S.</u>	Schoenner, J.,	630,521;
	Sheble, H.,	654,493;
	Shields, W.T.,	651,515;
	Swan, C.,	605,192;
	Smallwood, G.T.,	639,452;
	Smith, H.K.,	644,834;
	Stevens, G.H.,	650,431;

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<u>T.</u>	Treitschke, E.,	652,152;
<u>U.</u>		
<u>V.</u>	Valiquet, L.P.,	631,911;
	"	631,912;
	"	651,904;
	"	651,905;
	Vincent, J.A.,	602,490;
	von Wonwermans, P.,	646,014;
<u>W.</u>	Weaver, F.W.,	651,402;
	Williams, D.S.,	619,916;
	Wolcott, H.G.,	649,385;
	"	650,739;
	Wolf, R.,	629,534;
<u>X.</u>		
<u>Y.</u>		
<u>Z.</u>		

(No Model.)

3 Sheets—Sheet 1.

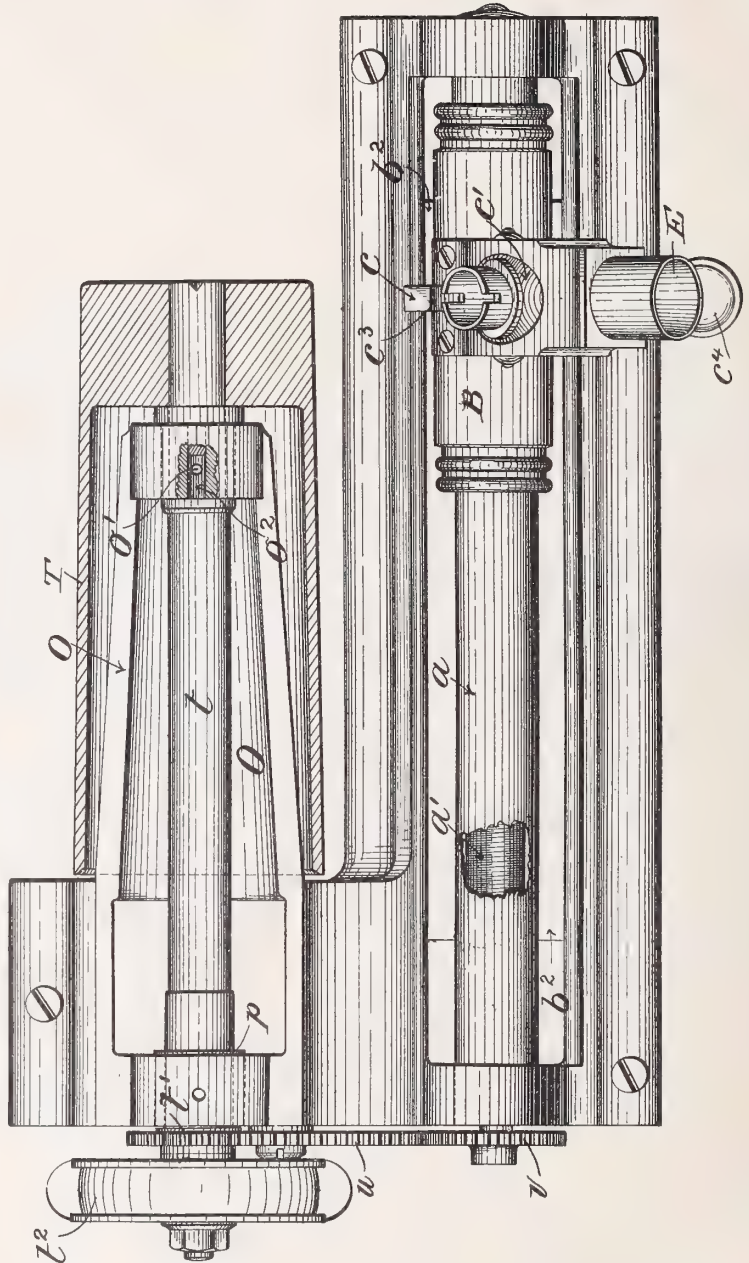
T. H. MACDONALD.
GRAPHOPHONE.

No. 579,595.

Patented Mar. 30, 1897.

Fig. 1.

A



Witnesses
W. R. Edlin.
J. W. Lewis

Inventor.

Thomas A. Macdonald,
by J. W. Lewis,
his attorney.

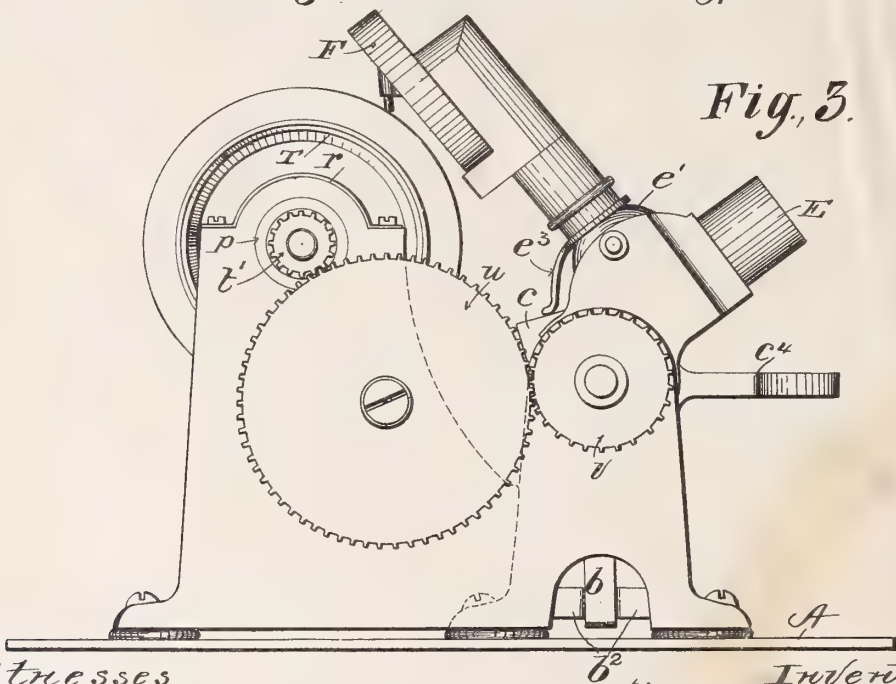
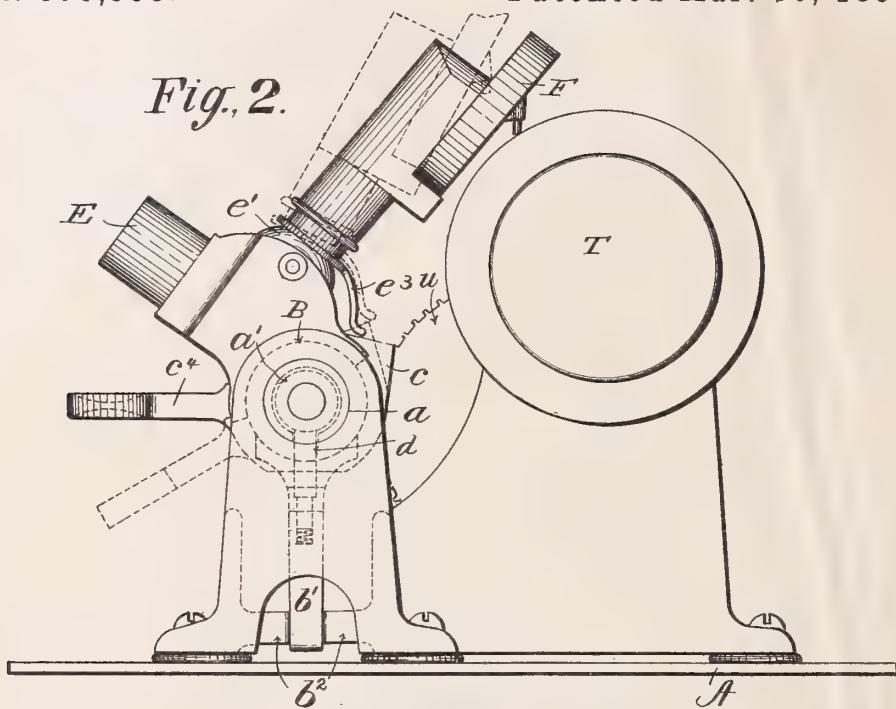
(No Model.)

3 Sheets—Sheet 2.

T. H. MACDONALD.
GRAPHOPHONE.

No. 579,595.

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Witnesses
W. R. Edlin,
J. W. Lewis.

Inventor.
Thomas H. Macdonald
by J. W. Lewis
his attorney

(No Model.)

3 Sheets—Sheet 3.

T. H. MACDONALD.
GRAPHOPHONE.

No. 579,595.

Patented Mar. 30, 1897.

Fig. 4.

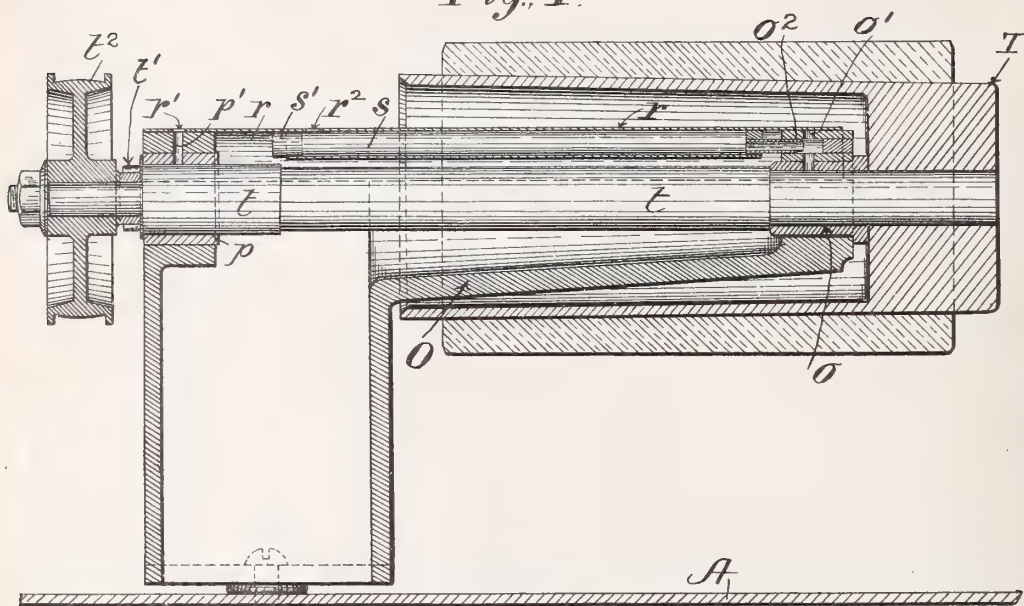


Fig. 5.

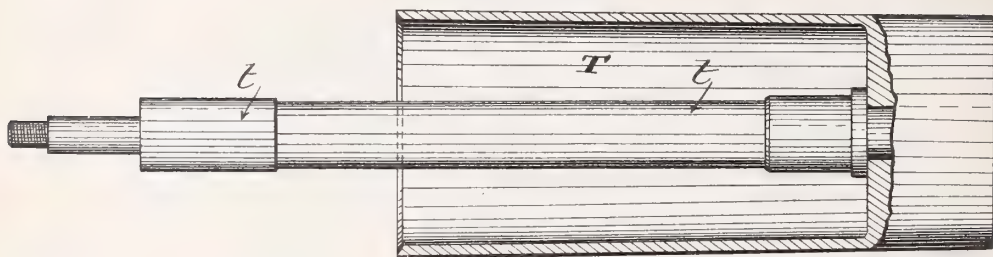


Fig. 6.

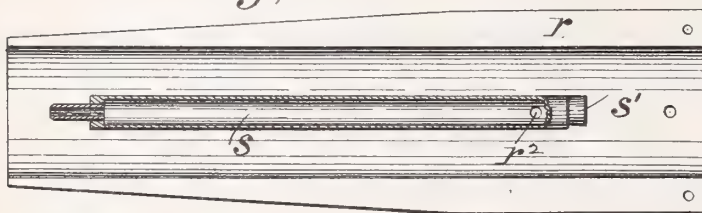


Fig. 7.



Witnesses
W. R. Edelin.
Peter Laro.

Inventor.
Thomas H. Macdonald
by J. J. Mauro,
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 579,595, dated March 30, 1897.

Application filed November 27, 1896. Serial No. 613,616. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Graphophones, which improvements are fully set forth in the following specification.

The principal object of my present invention is to dispense with the end gate which carries the bearing for one end of the mandrel-shaft in graphophones and phonographs as heretofore generally constructed. In accomplishing this object I support the mandrel entirely from one end thereof, thus leaving its other extremity entirely free and unobstructed, so that a record tablet or cylinder can be slipped onto and off of the mandrel with the greatest facility and without the necessity of swinging open an end gate or in any other way disturbing the normal arrangement of the parts of the machine. The elimination of the end gate obviously removes from the machine a very troublesome part, the absence of which permits a much more compact and greatly-simplified structure which can be produced at a great reduction in cost. In thus dispensing with the end gate and supporting the mandrel entirely from one end the greatest difficulty encountered is to provide bearings which will so maintain the mandrel in a horizontal position as to prevent sagging at its free end, which would result in imperfections in the operation of the machine both in recording and reproducing. This would be the result if it were attempted to remove the end gates from the machines as heretofore constructed. One way of overcoming the difficulty is to project the shaft of the mandrel a sufficient distance from the end thereof to accommodate a long bearing, but such arrangement would detract greatly from the compactness of the machine, which at the present stage of the development of this art is of much importance. As a much preferable construction I make the mandrel hollow, with its shaft extending centrally therethrough, the bearing for one end of the shaft being located on an overhanging arm of the machine, projecting into the hollow mandrel from one end of the latter. With one bearing for the shaft thus located within the mandrel and the other bearing located

exterior to the same and at one end thereof a rigid support for the mandrel is afforded, while all of the desirabilities as to compactness and simplicity of structure are realized. 55

Other features of the invention, as well as those above referred to, will be better understood by reference to the accompanying drawings, illustrating what has been practically demonstrated to be a very successful embodiment of my invention in an operative machine, and wherein— 60

Figure 1 is a plan view partly in section and with parts removed. Fig. 2 is an end elevation looking from the right of Fig. 1. 65 Fig. 3 is an end elevation from the opposite side of the machine. Fig. 4 is a vertical section through the mandrel. Fig. 5 is a detail in section of the mandrel, and Figs. 6 and 7 are details of the cover which fits over the overhanging arm. 70

Referring to the drawings, A represents the base-plate of the machine, beneath which is located a suitable motor. (Not shown.)

a is the usual guide-tube, slotted on its under side and inclosing feed-screw *a'*. 75

B is the carriage sliding on the tube *a* and having a depending leg *b'*, sliding between two flanges *b² b³*, Fig. 2.

d is a segmental nut adapted to engage the feed-screw for imparting movement to the carriage. 80

c is a ring on the carriage concentric to the feed-screw and guide-tube and having cam-surfaces on its periphery for disengaging the nut from the feed-screw and for lifting the reproducer or recorder from the record-cylinder, as hereinafter described. 85

c' is a handle on the ring *c* for manipulating said ring and for sliding the carriage along the guide-tube when nut *d* is disengaged from the feed-screw. 90

e is a pivoted joint at the end of sound-conducting passage E, to which recorder or reproducer F is attached. 95

e' is a depending arm on joint *e'*, bearing against a cam-surface on ring *c*, and whereby the recorder or reproducer is lowered upon and lifted from the record.

The parts of the machine as thus far described are substantially similar to corresponding parts in Patent No. 569,290, dated 100

October 13, 1896, granted to the American Graphophone Company upon an application filed by myself.

From the left-hand end of the framework of the machine projects an arm or horn O, located to the rear of and somewhat above the guide-tube and parts sliding thereon, and extending practically parallel thereto. The arm O is semicircular in cross-section with its concave side upward and has at its extremity or overhanging end an annular bearing *o*, which has a vertical oil-opening *o'* through its upper side, intersected by a horizontal oil-passage *o''*, through which oil is fed from a suitable receptacle, as hereinafter described.

At the end of the machine and in line with bearing *o* is a second annular bearing *p*, to which a vertical oil-passage *p'* leads. Over the arm O fits an arched cover *r*, having openings *r'* *r''* through its top, the former leading to passage *p'* and the latter to a tubular oil-receptacle *s*, secured against the under side of cover *r* and having a contracted portion at one end projecting into the horizontal oil-passage *o''*. The other end of the oil-receptacle is closed by a suitable plug *s'*.

It is a hollow mandrel open at one end and having a solid portion at its other end, from which a shaft or axle *t* projects centrally through the chamber of the mandrel and for some distance beyond the open end thereof, as shown in Fig. 5.

When the mandrel is in place on the machine, the arm O projects into the space between shaft *t* and the inner end of the mandrel, said shaft passing through and resting in bearings *o* and *p* and carrying at its extremity a small gear-wheel *t'* and a pulley *t''*, which latter is driven from a motor (not shown) by a suitable belt. Gear *t'* meshes with an idler *u*, which in turn engages a gear *v* on the end of feed-screw *a'*.

Modifications in the construction herein shown and described may be made without departing from the nature and principle of the invention.

Having thus described my invention, what

I claim as new, and desire to secure by Letters Patent, is—

1. In a graphophone, the combination with the mandrel and its shaft rigidly secured thereto, of a bearing in which the latter rotates located within the mandrel, and means for driving the shaft to rotate the mandrel, substantially as described.

2. In a graphophone, the combination with a hollow mandrel and its shaft rigidly secured thereto and extending centrally therethrough, of a bearing for one end of said shaft located within the mandrel, a bearing for the other end of the shaft exterior to the mandrel, and means for rotating the mandrel, substantially as described.

3. In a graphophone, the combination with a hollow mandrel closed at one end and open at the other, of a shaft rigidly secured to and extending centrally through the interior of the mandrel, a projecting or overhanging arm on the machine extending into the hollow mandrel and on which the mandrel-shaft has its bearing, and means for rotating the mandrel, substantially as described.

4. In a graphophone, the combination with a hollow mandrel open at one end and closed at the other, of a shaft rigidly secured in the closed end of the mandrel and extending centrally through the interior of the latter, a hollow projecting or overhanging arm on the machine extending into the open end of the mandrel about the shaft, a bearing for the shaft located on the end of the arm within the mandrel, a cover for the arm having an oil-passage leading to said bearing, said passage having a feed-opening outside of the mandrel, another bearing for the shaft, exterior to the mandrel, and means for rotating the mandrel, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

G. A. STEVENSON,
E. M. SCRIBNER.

(No Model.)

E. H. AMET.
PHONOGRAPH OR TALKING MACHINE.

No. 580,591.

Patented Apr. 13, 1897.

FIG. 5.

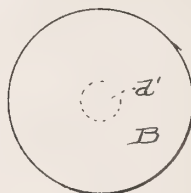


FIG. 1.

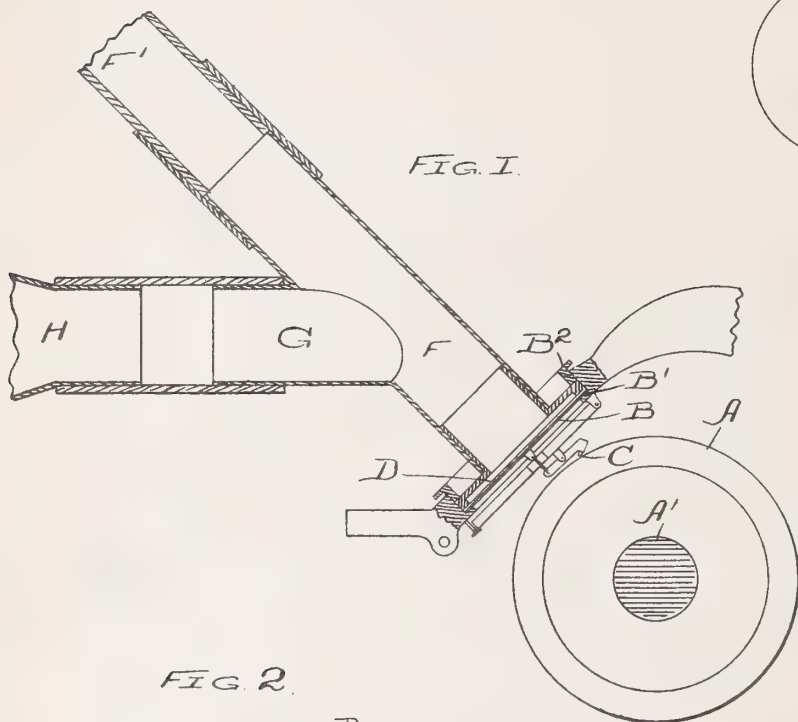


FIG. 2.

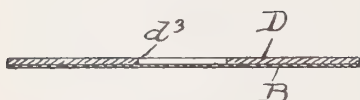


FIG. 3.

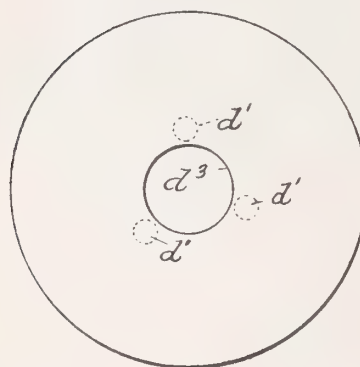
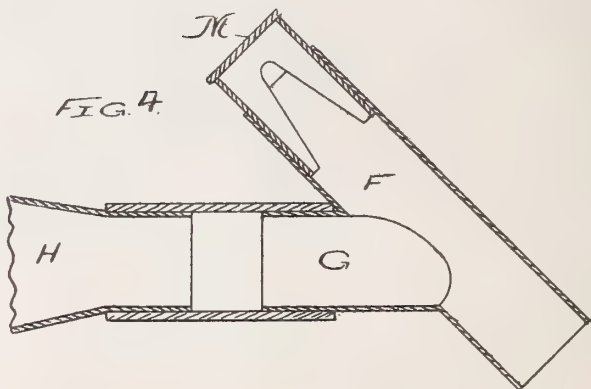


FIG. 4.



WITNESSES:

Sew. C. Curtis
J. W. Munday,

INVENTOR:
EDWARD H. AMET

BY *Munday, Curtis & Adcock.*

HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD H. AMET, OF WAUKEGAN, ILLINOIS.

PHONOGRAPH OR TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 580,591, dated April 13, 1897.

Application filed March 28, 1896. Serial No. 585,178. (No model.)

To all whom it may concern:

Be it known that I, EDWARD H. AMET, a citizen of the United States, residing at Waukegan, in the county of Lake and State of Illinois, have invented a new and useful Improvement in Phonographs or Talking-Machines, of which the following is a specification.

My invention relates to improvements in phonographs or talking-machines.

Heretofore with the phonographs, graphophones, or talking-machines in use it has not been practicable to record and reproduce the ordinary voices of lady singers, for the reason that with ladies' or high-pitched voices the ordinary construction of diaphragm does not seem to respond properly thereto, the result being a discordant, confused, and unintelligible record and reproduction, especially if the lady singer is sufficiently close to the mouthpiece or sings loud enough to produce a useful or commercial record.

The special object of my invention is to so improve the construction of the phonograph, graphophone, or talking-machine as to render it capable of properly and perfectly recording and reproducing voices of lady singers with clearness and distinctness, and incidentally also to cause it to more perfectly record and reproduce other voices, music, and other sounds.

I have discovered, after numerous experiments, and herein my invention consists, that songs of lady singers or other high-pitched sounds may be clearly, distinctly, and perfectly recorded on any ordinary construction of phonograph, graphophone, or talking-machine, when the lady singer sings loudly and naturally and directly into the mouthpiece, by the simple expedient of covering the ordinary glass diaphragm with a thin sheet or disk of soft rubber, the same being tacked or cemented near its center to the diaphragm, and by providing the tube leading from the diaphragm to the mouthpiece with a vent opening or tube extending at an angle to the speaking-tube. The thin sheet or disk of soft rubber serves to cushion the impact of the sound-waves against the diaphragm, or to prevent false, improper, or imperfect or interfering vibrations thereof, or in some other way to prevent the record of ladies' or high-

pitch voices being the customary discordant and unintelligible jumble of sounds heretofore generally produced when it has been attempted to record them by the use of machines having the ordinary or uncovered diaphragms; and the vent with which the speaking-tube is provided also tends to prevent false or improper or imperfect or interfering vibrations of the diaphragm and the record of the same on the phonograph tablet or cylinder. The soft-rubber covering for the diaphragm may also be used with the greatest advantage upon the reproducer.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts in all the views, Figure 1 is a central vertical section through the diaphragm and speaking-tube of a talking-machine, phonograph, or graphophone embodying my invention. Fig. 2 is an enlarged detail sectional view of the diaphragm and its soft-rubber covering, and Fig. 3 is a plan view of the same. Fig. 4 is a central vertical detail section, and Fig. 5 is a plan view showing a modification.

In the drawings, A represents a phonogram cylinder or tablet; A', the holder or shaft upon which the tablet is revolved; B, the diaphragm; B' B², the supporting-ring for the rim of the diaphragm, and C the recording point or instrument. All of these parts may be of any ordinary or customary construction—such, for example, as that now generally in use in the familiar phonographs or graphophones.

D is the thin soft-rubber covering for the diaphragm, the same being preferably of the same diameter, so that it may be secured in its place at the edges by the rings B' B², between which the diaphragm itself is clamped. This cushion or covering of soft rubber is tacked, secured, or otherwise fastened with any suitable glue, cement, or mucilage near its center to the diaphragm, in order that the loose unstretched disk or covering of soft rubber may lie flat and securely against the diaphragm.

In practice in attaching the soft-rubber disk or covering D to the diaphragm I ordinarily apply one or more fine spots of mucilage or other glue or cement *d' d'* to the dia-

phragm and then press the flat circular sheet or disk of the soft rubber thereon, causing the mucilage to spread out somewhat, as indicated by the dotted lines d' in Fig. 3, the dotted lines d' indicating the area where the soft-rubber disk is cemented or attached to the diaphragm. The thin sheet or disk of soft-rubber covering is preferably about one sixty-fourth of an inch in thickness, although the thickness may be increased or diminished, and it should preferably be made of pure gum and cut of the same size and diameter as the diaphragm, so that it may be applied thereto without stretching it in any direction in order to cause it to cover the whole diaphragm. The thin disk of soft rubber thus forms a soft elastic coating for the diaphragm.

F is the speaking-tube, or tube leading from the diaphragm B to the mouthpiece F', this tube or mouthpiece being of any ordinary construction.

G is the vent opening or tube leading into the speaking-tube F at an acute angle thereto near its lower or diaphragm end, preferably about as illustrated in the drawings. When the singer or operator sings or speaks into the mouthpiece F', the vent opening or tube G tends to prevent reverberations of the sound-waves in the air in the tube F and false or over vibrations of the diaphragm and enables me to produce much more distinct, clear, and perfect records than can be produced when this vent opening or tube is omitted, especially when the operator or singer sings or speaks loudly and directly into the mouthpiece, as required in making useful commercial sound-records.

When the machine is being used for taking or recording instrumental music, I prefer to attach the horn or receiving-trumpet H to the branch G and use the tube F as the vent. When vocal and instrumental music are being simultaneously taken or recorded, I ordinarily attach the receiving trumpet or horn H for the instrumental music to the branch G and the mouthpiece-tube F' to the tube F, in which case the tube G operates as a vent for the vocal sound-vibrations of the air in the tube F, adjacent to the diaphragm, while, on the other hand, the tube F operates as a vent or escape for the instrumental sound-vibrations received through the tube G.

In practicing my invention I have generally applied my soft-rubber coating or covering to the ordinary glass diaphragm now customarily in use in phonographs and graphophones, and in the drawings I have indicated a glass diaphragm, but my invention may be used with diaphragms made of any other material than glass. While the thin soft elastic coating D for the diaphragm is preferably composed of soft rubber, I wish it to be understood that my invention is not necessarily limited to this material.

As I have found by my experiments that

the soft elastic coating on the diaphragm is of great advantage for reproducing as well as recording sounds, my invention is not limited to its use in connection or combination with a recording point or stylus, but may be also used in connection or combination with a reproducing point or stylus, and as it is combined with a reproducing point or stylus in substantially the same manner as it is with a recording point or stylus it is not necessary to duplicate the drawings with a reproducing point or stylus substituted for the recording point or stylus which I have indicated in the drawings.

As illustrated in Fig. 4, the horn or receiving-trumpet is applied to the tube G, and the direct tube F is furnished with a regulating-cap M, having a slot m , preferably V-shaped, to adjust the area of the vent-opening. As the tubes F and G are of the same size, the regulating cap or valve M may also be applied to the angular tube G, if desired, but I find that usually the best results are produced without its being applied to the tube G when the singer sings directly into the tube F, the vent G being left entirely open.

The soft-rubber disk or covering D in its more perfected construction is provided with a small hole or opening d^2 at its center, substantially as illustrated in the drawings in Figs. 1 and 3; but this opening may be omitted, as shown in the modification Fig. 5.

I claim—

1. In a talking-machine the combination with a recording point or stylus, of a diaphragm, clamp-rings for supporting the diaphragm, a thin soft-rubber covering for the diaphragm, a speaking-tube leading to the diaphragm, and a vent opening or tube leading into said speaking-tube near the diaphragm, substantially as specified.

2. A diaphragm for a talking-machine having a thin soft-rubber covering, substantially as specified.

3. A diaphragm for a talking-machine, having a thin soft-rubber covering of the same diameter as the diaphragm so that it may be secured at its edges between the clamp-rings for the diaphragm, substantially as specified.

4. A diaphragm for a talking-machine having a thin soft-rubber covering, said soft-rubber covering being secured or cemented near its central portion to the diaphragm, substantially as specified.

5. A diaphragm for a talking-machine consisting of a thin disk of hard material, having a thin covering or coating of soft material, substantially as specified.

6. A diaphragm of thin glass or other hard material provided with a thin soft elastic covering or coating, substantially as specified.

7. A diaphragm of thin glass or other hard material, provided with a thin, soft, elastic covering cemented thereto near its central portion only, substantially as specified.

8. In a talking-machine, the combination

with a recording point or stylus, of a diaphragm, clamp-rings for supporting the diaphragm, a speaking-tube leading to the diaphragm and a vent opening or tube leading into said speaking-tube near the diaphragm, and a regulating cap or valve M for one of said tubes, substantially as specified.

9. A diaphragm of hard material for a talk-

ing-machine having a thin covering of soft material provided with a hole or opening near its center, substantially as specified.

EDWARD H. AMET.

Witnesses:

H. M. MUNDAY,
S. E. CURTIS.

(No Model.)

W. KAISLING.
RECORD CYLINDER FOR GRAPHOPHONES, &c.

No. 581,728.

Patented May 4, 1897.

Fig 1

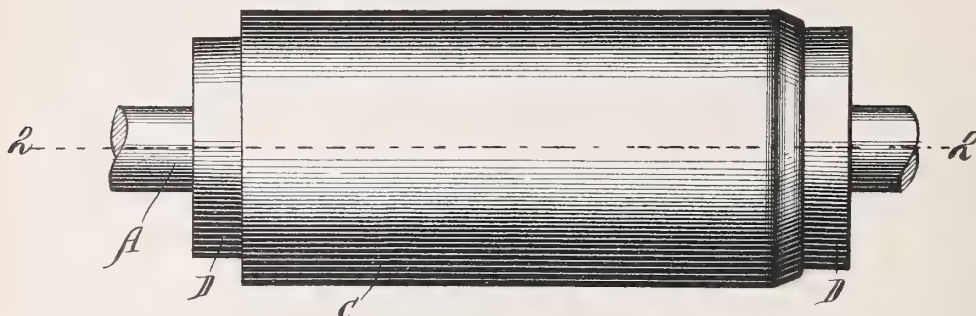


Fig 2

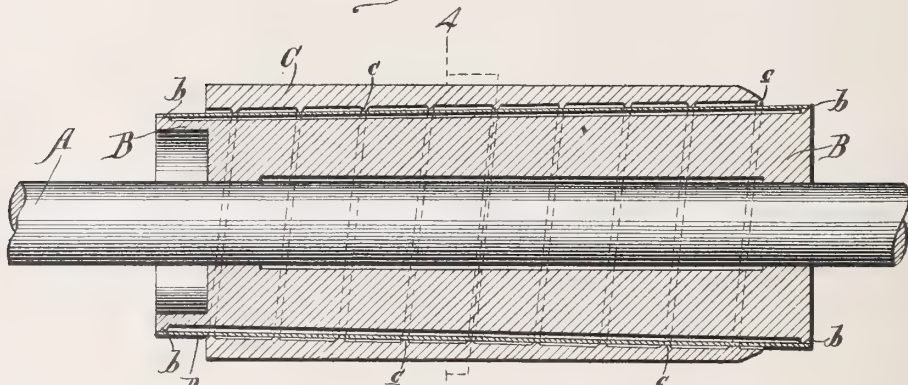


Fig 3

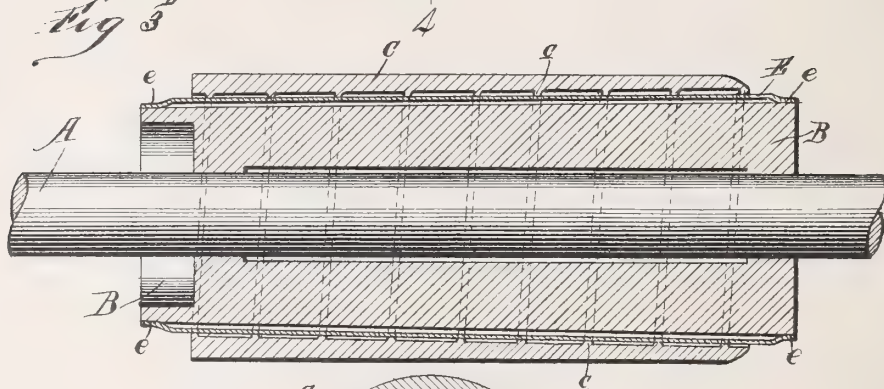
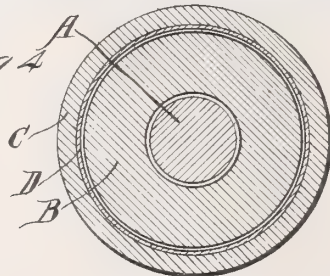


Fig 4



Witnesses
W. C. Corlies
C. A. Crawford

Inventor
William Kaisting
By Louis H. Gilson
Attorney

UNITED STATES PATENT OFFICE.

WILLIAM KAISLING, OF CHICAGO, ILLINOIS.

RECORD-CYLINDER FOR GRAPHOPHONES, &c.

SPECIFICATION forming part of Letters Patent No. 581,728, dated May 4, 1897.

Application filed February 15, 1897. Serial No. 623,526. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM KAISLING, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Record-Cylinders for Graphophones and the Like; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

In the drawings, Figure 1 is a side elevation of a complete cylinder. Fig. 2 is a central longitudinal section on the line 2 2 of Fig. 1. Fig. 3 is a central longitudinal section showing modified form of construction, and Fig. 4 is a transverse section on the line 4 4 of Fig. 2.

The impression or record cylinder proper of a graphophone or similar device is ordinarily made of a material which is quite brittle, and hence easily fractured. It is customary to make these cylinders tubular and mount them on a slightly-tapered mandrel, the bore of the cylinder having a corresponding taper, so that the parts are held together by friction only. The mandrel is of a rigid material, usually wood or metal, and is subject to but slight variations in size as a result in changes of temperature. The material of which the record-cylinder is composed expands and contracts under the influence of changes of temperature to a much greater degree than that of the mandrel, and hence it becomes necessary to exercise great care that the cylinder is removed from the mandrel after using and before there has been any material variation in the temperature of the apartment in which the instrument is situated. There is great danger also of fracturing the cylinder in adjusting it to the mandrel, as the latter has been heretofore made, by applying more force than is necessary to bring the parts into proper relation, the taper being so slight that a powerful wedge action results.

The object of this invention is to provide a slightly yielding and compressible seat for

the record-cylinder, yet one which will hold it firmly in place while in use; and to this end the invention consists in constructing the mandrel with a slightly-compressible surface, as hereinafter described.

In the drawings I show at A a conventional shaft for carrying the complete cylinder, and upon which the mandrel B is mounted. In one form of construction, as shown in Fig. 2, the mandrel B is provided at each end with an annular rib *b* and is inclosed within a sleeve D, preferably of stiff paper. The internal diameters of the two ends of the sleeve correspond with the external diameter of the two ribs *bb*, so that the sleeve fits snugly upon these ribs, to which it may be secured by the use of glue. The sleeve D is in this form of construction of uniform taper, so that intermediate of the ribs *bb* it is spaced apart from the body of the mandrel.

The impression-cylinder C is of ordinary construction, having the usual internal spiral rib *c*, and is of less length than the mandrel and when applied thereto fits upon the sleeve D and is located intermediate of the ribs *bb*.

In the construction shown in Fig. 3 the mandrel B is of uniform taper throughout its entire length, having no ribs, and to it is applied a sleeve E, of greater diameter than the mandrel, but having its ends contracted, as shown at *ee*, so as to fit snugly upon it to provide for the secure attachment of the two parts by the use of glue or other cement. The sleeve E, intermediate of its contracted ends, is of uniform taper and receives the mandrel-cylinder C in exactly the same manner as does the sleeve D.

When the sleeve D or E is made of a stiff fiber paper and of a length exceeding but little the length of the impression-cylinder, it forms a firm support for the latter and yet yields sufficiently under the pressure due to the contraction of the latter to remove all danger of its fracture. In applying the cylinder to the mandrel it may be safely forced thereupon sufficiently to somewhat contract the sleeve, and in the event of its expansion by the warming of the apartment the sleeve will expand to its normal size, and hence does not lose its hold upon the cylinder.

It is of course entirely immaterial whether the mandrel, intermediate of its ends, is of uniform taper or not, and if desired its body portion may be made much smaller in order
5 to lessen its weight.

I claim as my invention—

1. The combination of a rigid mandrel, with a flexible sleeve superimposed upon the mandrel but in contact therewith at its ends only,
10 and an impression-cylinder fitting upon the sleeve and being located wholly between the lines of contact of the sleeve with the mandrel.

2. In a mandrel for record-cylinders for graphophones or the like, the combination
15 with a rigid core, of a flexible sleeve super-

imposed upon the core and in contact therewith at its ends only.

3. In a mandrel for record-cylinders for graphophones and the like, the combination with a core having an annular rib at each
20 end, of a flexible sleeve inclosing the core and being mounted upon its ribs and spaced apart from its intermediate portions.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM KAISLING.

Witnesses:

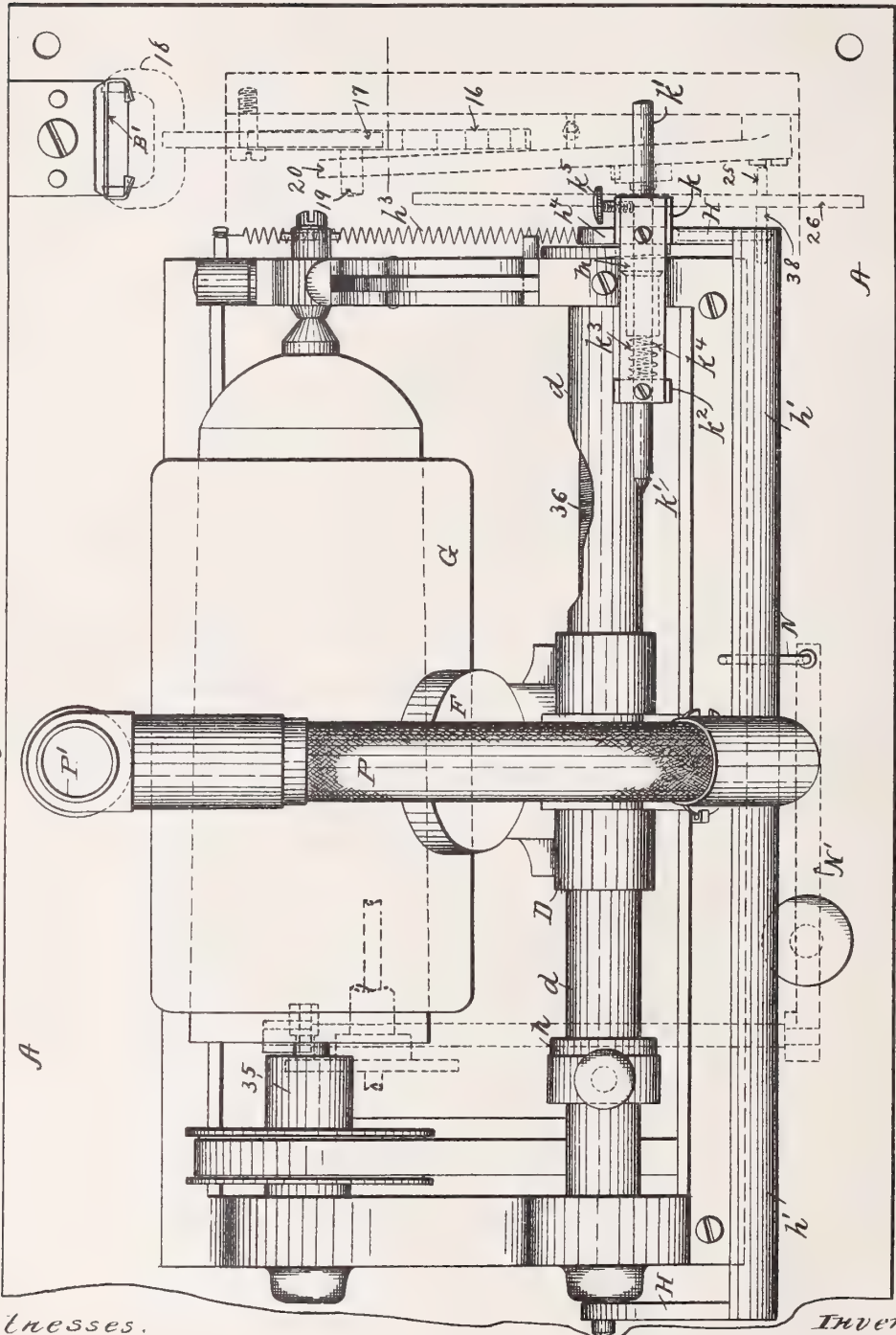
LOUIS K. GILLSON,
HESTER BAIRD.

T. H. MACDONALD.
COIN CONTROLLED GRAPHOPHONE.

No. 582,754.

Patented May 18, 1897.

Fig. 1.



Witnesses.

W. R. Edlin,
Jesse Lewis.

Inventor.

Thomas H. Macdonald
by Edward M. Mawds,
his attorneys

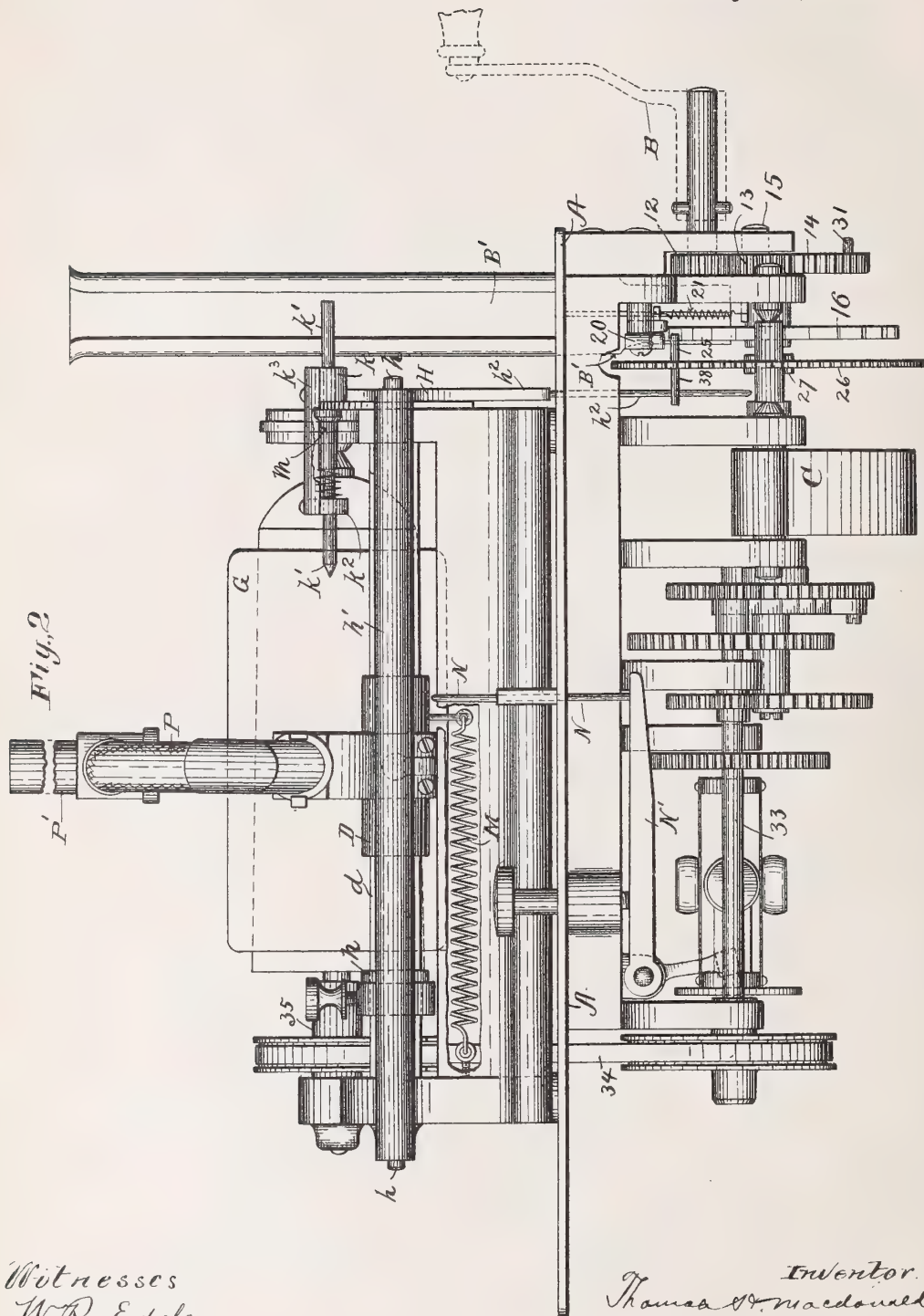
(No Model.)

4 Sheets—Sheet 2.

T. H. MACDONALD.
COIN CONTROLLED GRAPHOPHONE.

No. 582,754.

Patented May 18, 1897.



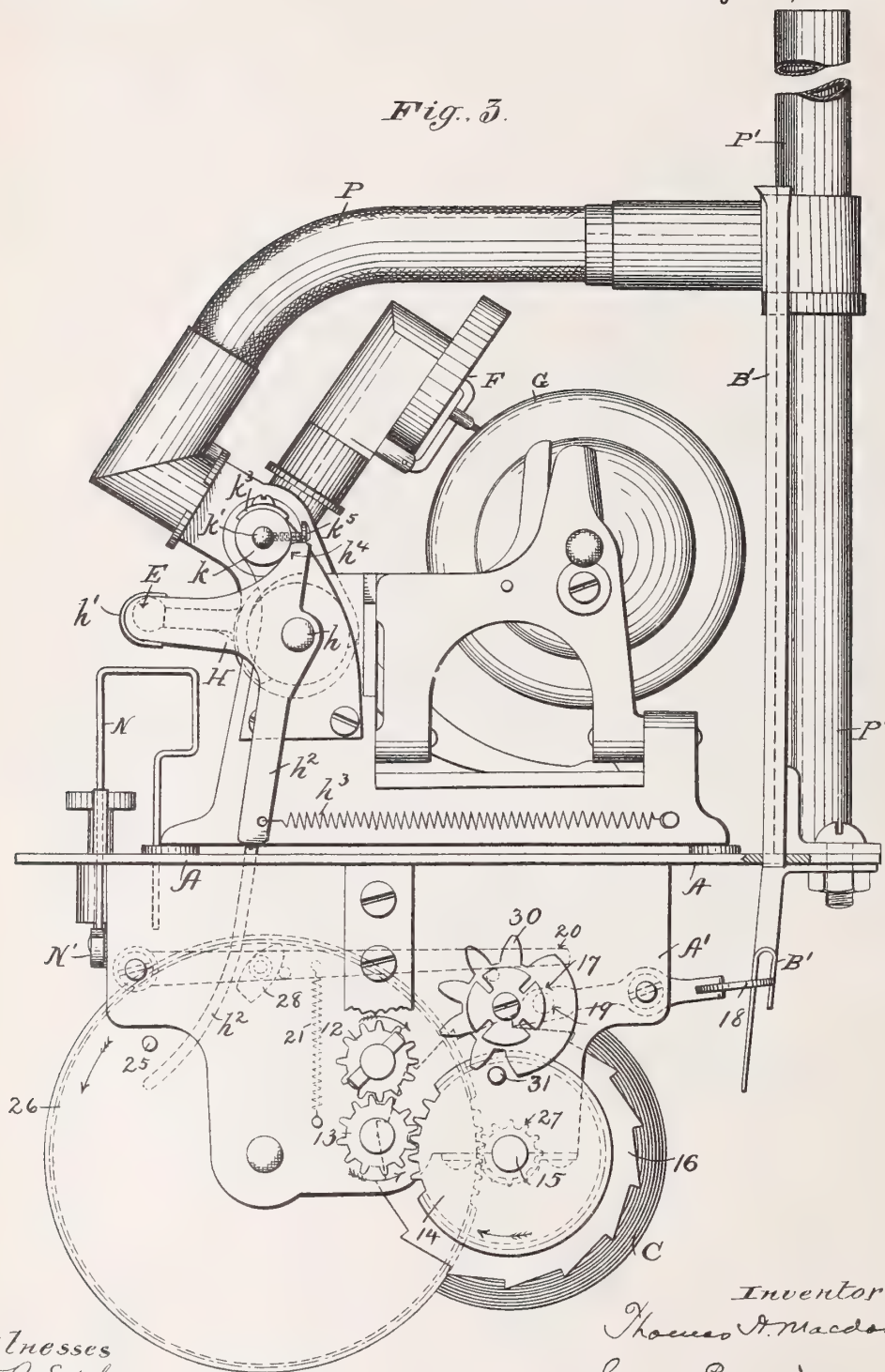
Witnesses
W. R. Edgson.
Rear Lewis

Inventor.
Thomas H. Macdonald
by Edward Maurs,
his attorneys

T. H. MACDONALD.
COIN CONTROLLED GRAPHOPHONE.

No. 582,754.

Patented May 18, 1897.



Witnesses
W. B. Edison,
J. E. Lewis.

Inventor
Thomas H. Macdonald
by J. E. Lewis,
his attorney.

(No Model.)

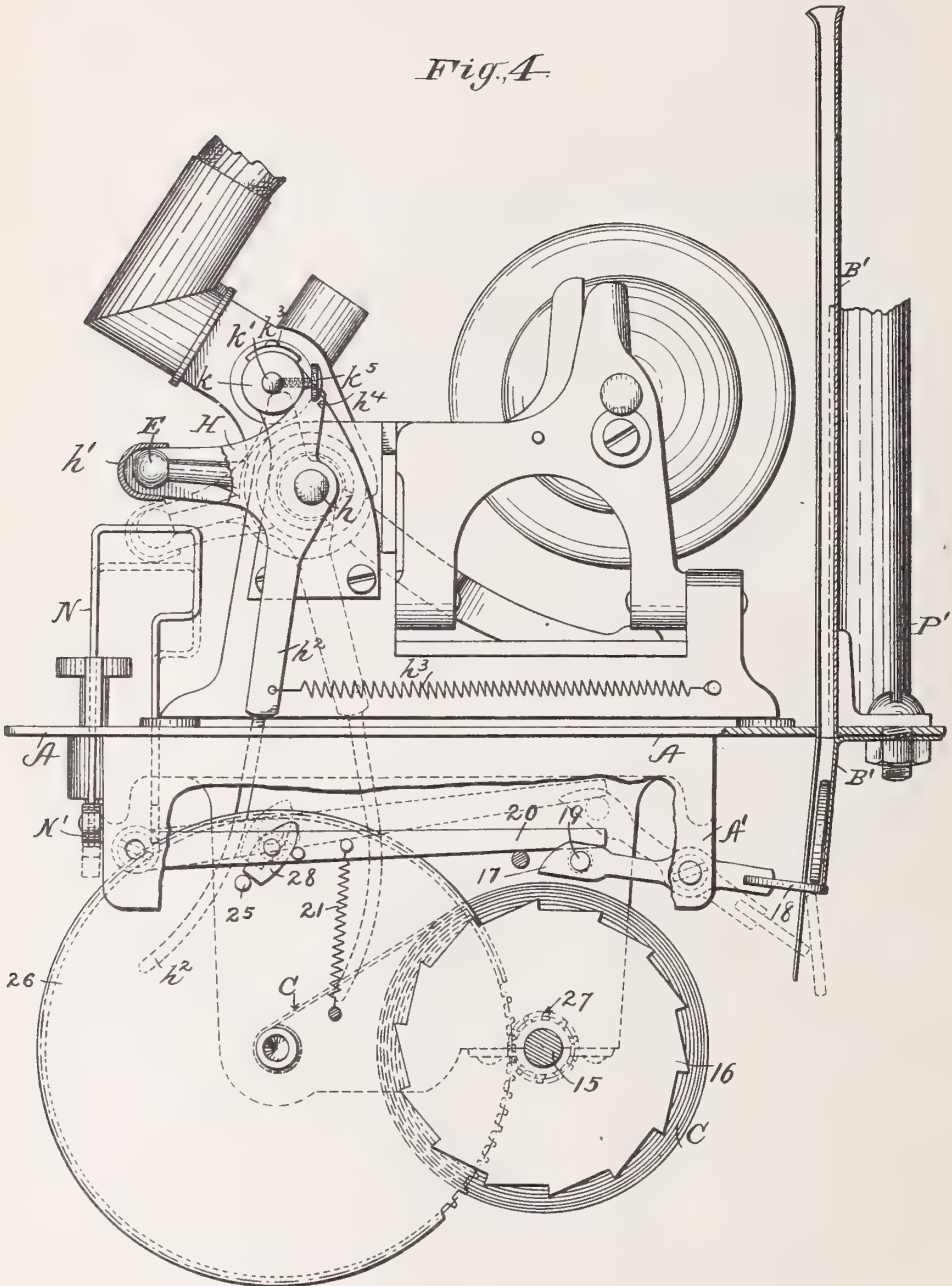
4 Sheets—Sheet 4.

T. H. MACDONALD.
COIN CONTROLLED GRAPHOPHONE.

No. 582,754.

Patented May 18, 1897.

Fig. 4.



Witnesses

W. R. Edelen,

Love Lewis

Inventor

Inventor
Thomas A. Macdonald

by Donatruaro
his attorneys

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT
OF COLUMBIA.

COIN-CONTROLLED GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 582,754, dated May 18, 1897.

Application filed February 6, 1897. Serial No. 622,358. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Coin-Controlled Graphophones, which improvements are fully set forth in the following specification.

This invention has reference to mechanism for controlling the operation of a graphophone by deposit of a coin, though some of its features may be applied to controlling apparatus other than graphophones. Its main object is to produce a simple and effective control mechanism not liable with ordinary care to derangement and which can be advantageously applied to a spring-motor. By the improvements hereinafter described the mechanism is much simplified in construction and greater certainty of action insured. In the use of mechanism of this sort the following operations have to be performed upon the deposit of the proper coin: The motor is started and the carriage of the reproducer engaged with the feed-screw. The reproducer is lowered into operative contact with the record-tablet. When the carriage reaches the end of its travel, the motor is arrested, the reproducer raised, the carriage disengaged from the feed-screw and returned to its normal position. According to the present invention a spring-motor is employed to operate the graphophone, and this motor is provided with the usual crank-handle for winding the spring. A locking device is also provided whereby the operation of the crank-handle is prevented until by deposit of a coin in the coin-chute the locking device is released. The user can now wind the spring until the limit-stop is reached. One of the gears of the winding mechanism carries or actuates a device which, when the spring is wound, raises the lever employed on ordinary commercial graphophones to throw the reproducer into and out of operative position and simultaneously to engage the carriage with or disengage it from the feed-screw. When the device (preferably a grooved or trough-shaped bar) which actuates said lever is raised, it is caught by a suitable latch, and the latter is released by contact of the reproducer-carriage when the

latter reaches the end of its movement. The bar is now pulled down by a spring, raising the reproducer and disengaging the carriage, and the same movement applies a brake to the motor. As the carriage is advanced by the feed-screw it puts a spring under tension, which spring returns it to its normal position when disengaged from the feed-screw.

Within the principles of this invention the various parts may take many different forms. The construction illustrated in the accompanying drawings is deemed the best, because it can be applied to ordinary graphophones and spring-motors in common use without necessitating any material change therein.

In the drawings, Figure 1 is a plan view of a graphophone provided with the improved controlling mechanism. Fig. 2 is a front elevation. Fig. 3 is an end elevation; and Fig. 4 is a similar view, parts being broken away and other parts shown in section.

The graphophone shown is substantially like that illustrated in Letters Patent No. 569,290, dated October 13, 1896, and will not require particular description. The spring-motor may likewise be of any approved form. Its arbors are supported in brackets depending from a bed-plate A of the machine. It is adapted to be wound by a crank-handle B through pinions 12 13 and spur-gear 14, the latter being on the arbor 15, to which the inner end of mainspring C is attached. Shaft 15 carries also a ratchet-wheel 16, upon which normally rests by gravity a detent 17, pivoted to the bracket A'. This detent normally locks the winding-gear. The rear end 18 of the detent or lock is bifurcated and embraces the lower end of the coin-chute B'. The weight of a coin on this end of the detent tilts it to the position shown in full lines, Fig. 4, unlocking the winding-gear. The detent does not tilt far enough to drop the coin, being arrested by contact of pin 19 on the detent with the end of a pivoted stop-arm 20, which is held by the tension of a spring 21. This spring is strong enough to resist the weight of the coin, and consequently during the winding the parts remain in this position. When the motor is running, the stop-arm is lifted against the pressure of its

spring, so that the coin can drop, as shown in full lines, Fig. 4, and the detent 17 return to its normal position. This operation is effected by a pin 25 on the large spur-gear 26, which receives motion from a pinion 27 on arbor 15. Wheels 26 27 are so proportioned that the former makes but one turn during the winding and unwinding of the spring. Arm 20 carries a pivoted lug 28, which pin 25 lifts and passes during the winding without disturbing the arm. During the reverse movement pin 25 in passing the lug 28 strikes the end thereof and lifts arm 20, permitting the detent to tilt further and drop the coin, as shown in dotted lines, Fig. 4.

The number of turns of the mainspring in winding and unwinding is limited by the action of a wheel 30. This wheel has a series of teeth extending part way round its periphery, one of which is engaged at each turn of the arbor 15 by a pin 31 on the face of gear 14. The number of these teeth fixes the number of turns that can be given the spring, since when pin 31 encounters the continuous portion of the wheel 30 movement in that direction is arrested.

The driving-shaft 33 of the spring-motor is connected, as usual, by a belt 34 to a pulley on the mandrel-shaft 35 of the graphophone, and the latter shaft communicates motion to the feed-screw 36 in the usual way. The feed-screw is as usual inclosed in the slide-tube *d*, upon which slides the reproducer-carriage D, tube *d* being open on its under side to permit engagement of the nut with the feed-screw, as well understood.

E represents the handle or device by which the reproducer F is moved into or out of contact with the record-tablet G and the carriage simultaneously engaged with or disengaged from the feed-screw. These parts are all well understood, and being, moreover, described in the patent above referred to, call for no particular description.

The operations of the carriage D are effected through a tilting frame H, pivoted at *h*. The front bar *h'* of this frame extends the entire length of the travel of the reproducer-carriage. It is U-shaped in cross-section, and the end of handle E extends into the recess. Hence by the tilting of frame H the handle may be thrown up or down. The frame has an arm *h*² extending downwardly through a slot in the bed-plate and into the path of a pin 38 on the large spur-gear 26, pin 38 being on the opposite face to pin 25. As wheel 26 turns in winding the mainspring pin 38 makes contact with arm *h*², gradually tilting the frame H against the pressure of a special spring *h*³. This movement raises the bar *h'* and with it the handle E, so that before the winding is arrested the reproducer F is lowered into operative contact with the record and its carriage D connected with the feed-screw and ready to start. It is necessary to provide means for keeping the frame H in

this position during the whole time determined for the forward movement of the reproducer. This is effected by a spring-catch *k* in the form of a hub or boss attached to a rod *k'* by a set-screw *k*⁵, rod *k'* being mounted to slide freely in a perforated stud *m*. Rod *k'* carries another boss *k*², loose thereon and attached to boss *k'* by a plate *k*³. Between the boss *k*² and stud *m* is a spring *k*⁴. Catch *k* normally rests against the side of a finger *h*⁴, which is part of frame H; but when the latter is raised finger *h*⁴ moves to one side of the catch and the latter springs in front of it, being actuated by spring *k*⁴. Frame H is thus kept in its elevated position, notwithstanding the withdrawal of pin 38, while the motor is unwinding. As the carriage D approaches the end of its forward movement it makes contact with the end of the rod *k'* and pushes the latch *k* from in front of finger *h*⁴. This releases frame H, which is immediately tilted back to its former position by spring *h*³. This movement reverses the handle E, lifting the reproducer and disengaging the carriage from the feed-screw. When so disengaged, the spring M returns the carriage to its starting-point. A buffer *n* is provided to prevent undue shock upon the return of the carriage.

It is desirable to adjust the travel of the reproducer to the length of the sound-record at the time on the machine, these records being of variable length. To this end the pin *k*² can be adjusted with reference to the catch *k* by loosening the set-screw *k*⁵, so that the pin can be set forward or back, as may be required. After the carriage has returned the motor may run on until arrested by the stop-wheel 30, as already explained; but it is preferable to arrest the motor the moment the carriage is released, and this is effected by the return movement of the bar *h'* of the frame H acting upon the usual brake-lever N' of the spring-motor through a sliding frame *n*.

A flexible tube P runs from the reproducer-carriage to an upright sound-conveying tube P', with which the horn or bearing-tubes are connected, as usual.

The operation will be readily understood. The user deposits the proper coin in the coin-chute. It falls on the lock or detent 17 and tilts the latter, unlocking the winding-gear. The user now winds the spring-motor until the movement of the winding-gear is arrested by the stop-wheel 30. Frame H has by this time been tilted and latched in its elevated position, so that the carriage is ready to start as soon as the user lets go of the crank-handle. The carriage runs the distance determined by position of the latch-pin *k*², upon reaching which latch *k* is actuated, releasing frame H, which is immediately retracted by its spring, raising the reproducer and disengaging its carriage from the feed-screw, this movement of the frame also operating the brake-lever. The carriage is retracted by

its spring and the parts are all in position for another operation. It is understood that the mechanism is properly boxed, so that access cannot be had to the working parts by unauthorized persons.

It will be evident that substantial parts of the control mechanism described can be applied to motors other than spring-motors, although specially adapted to the latter. It will also be evident that modifications may be made in the construction of different parts of the mechanism without departing from the spirit of the invention.

Having now fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the mainspring of a spring-motor, and with apparatus driven thereby, of an arbor to which one end of said mainspring is attached, winding-gear connected with said arbor and including a ratchet-wheel, a coin-chute, and a detent normally locking said wheel, but adapted to be disengaged by the deposit of a coin in said chute, substantially as described.

2. The combination with the mainspring of a spring-motor, and with apparatus driven thereby, of an arbor to which one end of said mainspring is attached, winding-gear connected with said arbor and including a ratchet-wheel, a coin-chute, a detent normally locking said wheel, but adapted to be disengaged by the deposit of a coin in said chute, and a stop limiting the number of turns given said mainspring in winding, substantially as described.

3. The combination with a spring-motor, and with a graphophone driven thereby, of a winding-gear for said motor, a coin-controlled lock for said winding-gear, starting mechanism for the graphophone, and connections for operating said mechanism from said winding-gear, substantially as described.

4. The combination with a spring-motor, and with a graphophone driven thereby, of a winding-gear for said motor, a coin-controlled lock for said winding-gear, starting mechanism for the graphophone, connections for operating said mechanism from the winding-gear, whereby the reproducer-carriage of the graphophone is connected with the motor when wound, and means for disengaging and returning the reproducer-carriage on reaching the end of its advance movement, substantially as described.

5. In a coin-controlled graphophone, the combination with a motor, a feed-screw driven thereby, the reproducer-carriage, and the handle for engaging said carriage with said feed-screw and for disengaging it therefrom, of a movable frame controlling said handle, mechanism controlled by the deposit of a coin, for moving said frame in one direction, means actuated by the reproducer-carriage on reaching the end of its forward movement for returning said frame to its normal position, and

means for returning the reproducer-carriage when disengaged from the feed-screw, substantially as described.

6. In a graphophone, the combination with the motor, the feed-screw, and the reproducer-carriage, of coin-controlled mechanism for starting the motor, connections operated upon the starting of the motor for engaging the carriage with the feed-screw, means operated by the carriage on reaching the end of its forward movement for disengaging said carriage from the feed-screw, and a spring for returning the carriage when disengaged, substantially as described.

7. In a coin-controlled graphophone, the combination with a motor, a feed-screw driven thereby, the reproducer-carriage, and the handle for engaging said carriage with said feed-screw and for disengaging it therefrom, of a movable frame controlling said handle, mechanism controlled by the deposit of a coin, for moving said frame in one direction, means actuated by the reproducer-carriage on reaching the end of its forward movement for returning said frame to its normal position, means for returning the reproducer-carriage when disengaged from the feed-screw, and a brake for arresting the motor operated by the return movement of said frame, substantially as described.

8. The combination with the motor, the feed-screw, the reproducer-carriage, and the handle for engaging the carriage with and disengaging it from the feed-screw, of a movable frame controlling said handle, coin-controlled mechanism for moving said frame in the direction to engage the carriage with the feed-screw, a spring-latch for holding the frame in its operative position, said latch having a part acted upon by the carriage on reaching the end of its movement to disengage it from said frame, and a spring for returning the frame and releasing the carriage, substantially as described.

9. The combination with a spring-motor, of winding-gear therefor, a coin-chute, a latch for locking said winding-gear having an end projecting into the chute, so that the weight of a coin tilts the latch and unlocks the driving-gear, a stop to prevent the latch tilting so far as to drop the coin, and connections operated by said motor to remove said stop and permit the dropping of the coin, substantially as described.

10. In combination with the spring-motor and winding-gear, a lock for said gear adapted to be released by the deposit of a coin, a stop-wheel having a series of teeth in part of its periphery, and a pin on one of the wheels of the winding-gear for engaging at each turn one of the teeth of the stop-wheel, substantially as described.

11. The combination with the spring-motor, the feed-screw and the reproducer-carriage having a handle for connecting the carriage and disconnecting it from the feed-screw, of

a tilting frame controlling said handle, coin-
controlled winding-gear for said motor, con-
nections from said winding-gear to tilt said
frame so as to connect the carriage with the
5 feed-screw, means for disconnecting the car-
riage from the feed-screw, and means for re-
turning the carriage to its starting-point, sub-
stantially as described.

In testimony whereof I have signed this
specification in the presence of two subscrib- ro
ing witnesses.

T. H. MACDONALD.

Witnesses:

ALICE B. KEOUGH,
S. L. CORDON.

(No Model.)

T. H. MACDONALD.
SPEED REGULATOR FOR MOTORS.

No. 587,265.

Patented July 27, 1897.

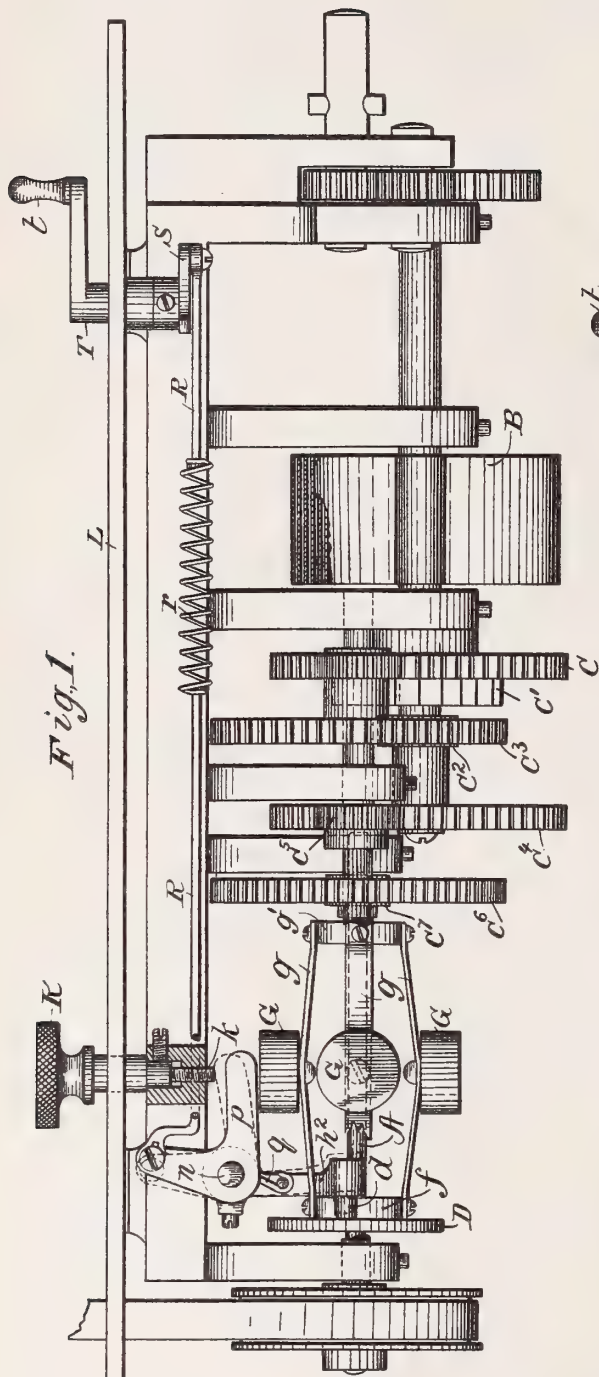


Fig. 1.

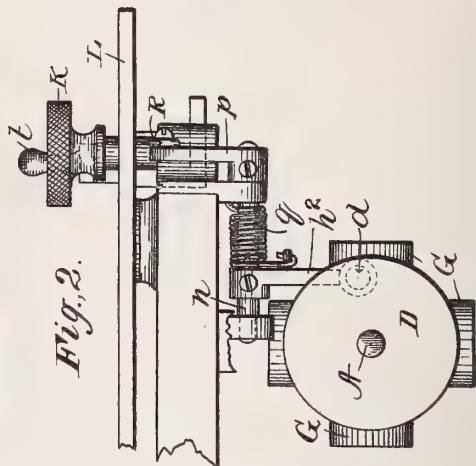


Fig. 2.

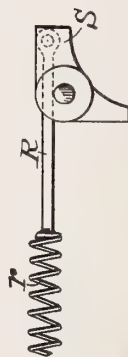


Fig. 3.

Witnesses.
W. R. Edelin.
Pear Lewis.

Inventor.
Thomas H. Macdonald,
by John Mauro,
his attorneys.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE
AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

SPEED-REGULATOR FOR MOTORS.

SPECIFICATION forming part of Letters Patent No. 587,265, dated July 27, 1897.

Application filed November 2, 1895. Serial No. 567,728. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Speed-Regulators for Motors, which are fully set forth in the following specification.

This invention has reference particularly to spring-motors, though applicable to other motors, the object thereof being to secure uniformity of operation with facility for adjustment within the desired limits. The invention was designed more particularly for graphophones to meet the imperative necessity of uniform running speed in recording and reproducing, but is, of course, applicable to motors employed for other purposes. As is well known, in the use of graphophones the slightest deviation from a uniform speed in running causes alteration of the pitch or key of the sounds, which in musical records is a grave defect. Consequently it is necessary to provide the motors for such machines with speed-controlling devices which perform their functions with great exactness.

Prior to this invention attempts to apply spring-motors to driving graphophones have not produced satisfactory results, mainly for lack of governing devices which would release the stored power of the spring with uniformity during the entire period of the expansion of the spring, which operates with constantly-diminishing force.

Spring-motors are usually controlled by governors operating on the principle of an escapement, but such governors lack the precision and certainty desired. According to the present invention the speed of the driving-shaft of the motor is regulated and controlled by a friction device, the pressure which gives rise to the friction being furnished by the spring itself. It is found, after extensive practical use, that, by the means herein described, the expanding force of a coiled spring can be successfully applied to driving graphophones with the uniformity necessary for the uses to which those instruments are put.

The principle of the invention may be carried out in various forms of devices, and I will herein describe a form that has given good results in practice. The driving-shaft (or it may

be another convenient shaft geared thereto) is provided with a device, such as a disk, connected to rotate with the shaft, but capable of assuming different positions lengthwise thereof. This device has mechanical connections with said shaft whereby its position lengthwise thereof is automatically varied by the motion of the shaft. These connections are perfectly flexible supports carrying centrifugal balls, as in the common governor. Coöperating with this disk is a friction device, such as a stud or pin, preferably of leather, or having an acting face covered with leather or similar material. This device is relatively stationary and its function is to act as a break against the revolving disk. When the motor is started, the movement of the centrifugal balls brings the disk in contact with the leather pin or stud with a pressure that is proportional to the force of the motor, thus maintaining a uniform speed by exerting a constant check upon the force driving the shaft.

In all governing mechanism of various sorts which act, when excess of speed is developed, by cutting off the power or (which is equivalent) by disconnecting momentarily the driven mechanism from the prime motor, thus bringing it down to the normal, there is always a fall to a certain degree below the normal speed before the governor can act to restore the connection, and thus, while average uniformity of speed is maintained there is usually a rhythmical variation which is objectionable when the instrument is used for reproductions.

In the mechanism constructed in accordance with this invention the power of the spring is constantly exerted on the shaft and the speed of the latter kept down to the normal by a constantly-acting friction device, the friction varying in direct ratio with the power of the spring.

The relatively stationary member of the friction device is adjustable to vary the normal rate of speed, the construction permitting about the same amount of pressure to be developed against the shaft at low as at high speeds. This adjustable member may be carried by a screw in a threaded socket. The adjustable stud or pressure device also

serves as a stopping device, being connected with a button or other convenient switch, so that it can be thrown against the disk with pressure sufficient to arrest the shaft. In such case a spring is provided to return it to the point to which it has been adjusted for speed, this adjustment not being disturbed by the use of the device for stopping the motor.

In the accompanying drawings, Figure 1 illustrates in front elevation a spring-motor for graphophones constructed in accordance with my invention. Fig. 2 is an end view of the governing mechanism, and Fig. 3 is a detail in plan.

I represents the bed-plate of a graphophone by which the motor is supported.

B represents a mainspring, and C C' represent a train of gears by which motion is communicated to the driving-pulley and to the shaft A, upon which the centrifugal governor is mounted. The centrifugal balls G are carried by springs *g*, attached at one end to the sleeve F, loosely mounted on shaft A, and at the other to the collar *g'*, fixed to said shaft.

To sleeve F is attached a disk D, which constitutes one member of the frictional regulating device, and adjacent to this disk is the relatively stationary member, shown as a stud *d*, preferably of leather or other comparatively soft material. It will be obvious that as the shaft A rotates the balls G will by centrifugal force move outward from the shaft, bending springs *g* and pressing disk D against stud *d* with a force proportional to the speed of rotation. When the motor is started, the disk D moves to the right until its face makes contact with the stud, and these surfaces are in contact during the whole time the motor is running. The degree of pressure depends on the torque of shaft A and the resistance of the driven mechanism, and if there be any irregularity in either the result will be apparent not in a variation of the speed of the motor, but in a variation of the pressure between the members of the frictional regulator which are in constant contact.

As shown, the friction pin or stud *d* is carried by an arm *h*², attached to a rock-shaft *n*. Rock-shaft *n* also carries a bell-crank lever *p*, one arm of which extends under the lower end of the adjusting-screw *k*, provided with the adjusting-button K. A spiral spring *q* is provided, tending to throw the arm *p* against screw *k*, as indicated in dotted lines in Fig. 2, thus fixing the position of stud *d* with respect to disk D. It will be seen that this position could be varied by turning button K.

The mechanism has a further function as a starting and stopping device. For this purpose a link R is attached at one end to the vertical arm of bell-crank lever *p* and at the other to a crank-arm S on a shaft T, which is also provided with a switch arm or handle *t*. Link R is made extensible by forming a portion thereof as a stiff helical spring *r*. When handle *t* is turned to the position indicated in Figs. 1 and 3, lever *p* is turned, causing

stud *d* to bear with the pressure of the strong spring *r* against the disk D, thus arresting the motion by a brake action. The motor-shaft is shown in Fig. 1 as being thus arrested. When the position of handle *t* is reversed, spring *q* returns lever *p* to its normal position against screw *k*. Thus the stopping and starting of the motor can be effected without changing the speed adjustment.

From the foregoing description and the illustrations given of practical embodiments of my invention it will be evident that other modifications in the forms and dispensations of the parts may be made, these matters of detail being in some degree controlled by the construction of the motor to which the improved regulator is applied.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a spring-motor, the combination with the main driving-spring thereof, of a friction speed-regulator comprising a relatively stationary member, means for adjusting the position thereof, a relatively movable member, connections whereby the spring presses the two members of the regulator together, and means for pressing the two members forcibly together to stop the motor without changing the adjustment for speed, substantially as described.

2. A speed-governor for motors, comprising in combination a shaft driven by the motor, a disk rotating with said shaft but movable lengthwise thereof, centrifugal devices for moving the disk lengthwise of the shaft, a relatively stationary friction device with which said disk engages, means for adjusting the position of said device to determine the rate of speed of the motor, and independent means for moving said device into engagement with said disk with force sufficient to arrest the motor, substantially as described.

3. A speed-governor for motors, comprising in combination a shaft driven by the motor, a disk rotating with said shaft, centrifugal devices for varying the position of said disk lengthwise of said shaft according to the speed of the latter, a lever controlling a friction device for engaging said disk, an adjusting-screw, a spring normally keeping said lever in contact with said screw, and means for overcoming said spring and forcibly pressing said friction device against said disk, without disturbing the position of said adjusting-screw, substantially as described.

4. In a frictional speed-regulator for motors, the combination with one of the motor-shafts of a disk rotating therewith, connections for displacing the disk longitudinally of said shaft by the motion of the latter, said disk constituting one member of the frictional regulator, a friction device or stud constituting the other member, adjusting mechanism for regulating the normal position of said stud relative to said disk thereby determining the speed of the motor, and means independent of

said adjusting mechanism, for pressing said stud forcibly against said disk, thereby stopping the motor, substantially as described.

5 The combination with the shaft, the disk constituting one member of a frictional speed-regulator, said disk being connected with said shaft as specified, a stud forming the other member of said regulator, a holder therefor, a two-arm lever connected with said holder, an
10 adjusting device acting on one arm of said lever but disconnected therefrom, and a switch arm or handle connected with the other

arm of said lever, whereby said stud may be forcibly pressed against said disk to stop the motor without disturbing the said adjusting
15 device, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

CLEMENT MARCH,
G. L. HUBBELL.

(No Model.)

2 Sheets—Sheet 1.

T. L. DENNIS, Jr.
PHONOGRAPH.

No. 590,643.

Patented Sept. 28, 1897.

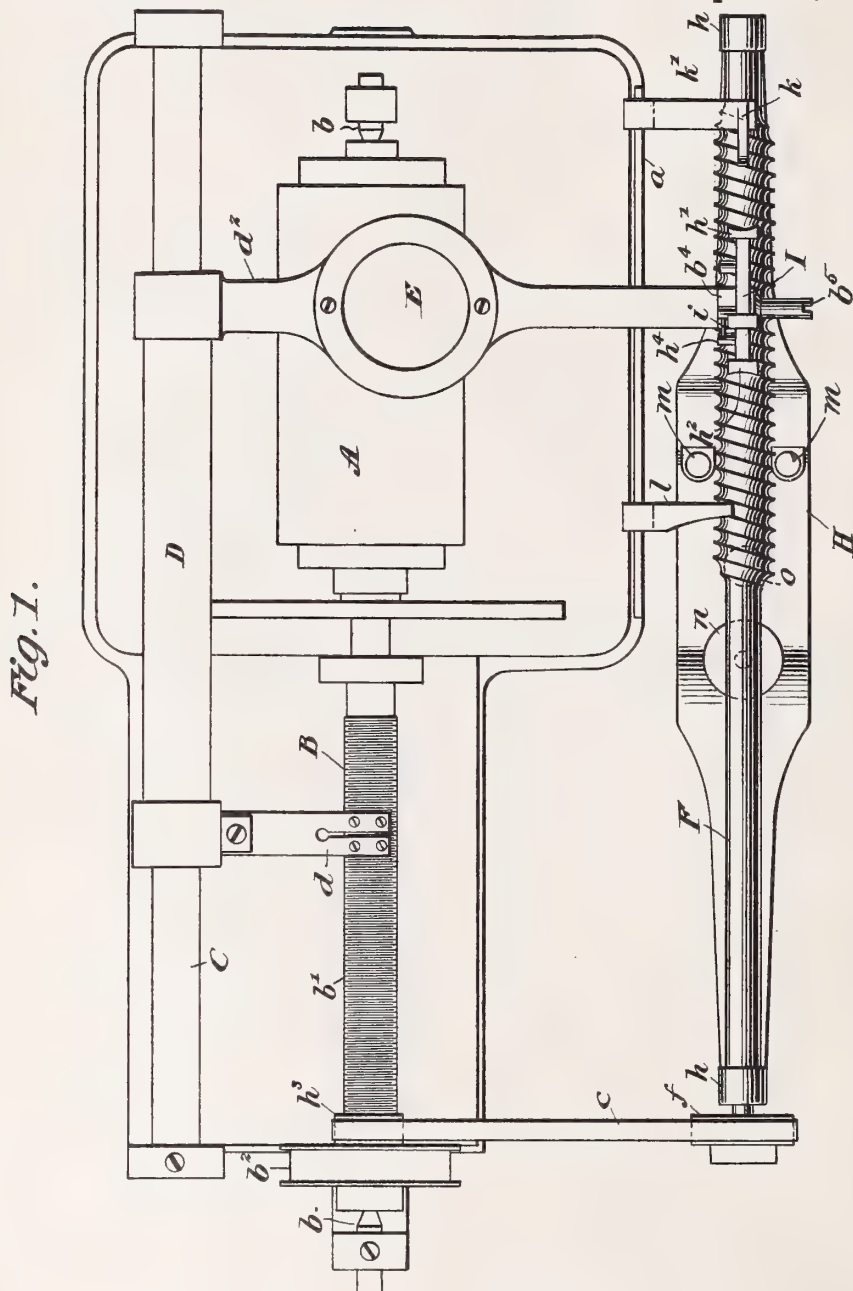


Fig. 1.

WITNESSES:

Frank S. Ober.

Robt. D. Hedican

INVENTOR

Thomas L. Dennis Jr.

BY *Wm. H. Appleton.*

ATTORNEY.

(No Model.)

2 Sheets—Sheet 2.

T. L. DENNIS, Jr.
PHONOGRAPH.

No. 590,643.

Patented Sept. 28, 1897.

Fig. 3.

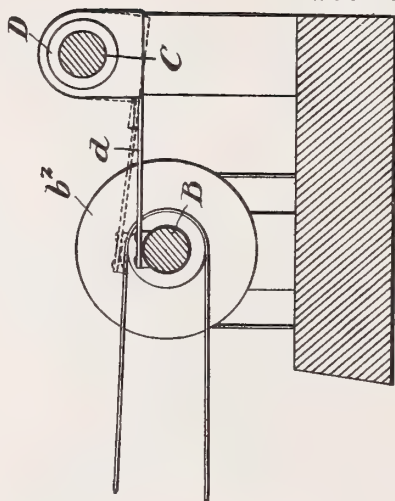


Fig. 5.

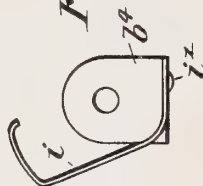


Fig. 2.

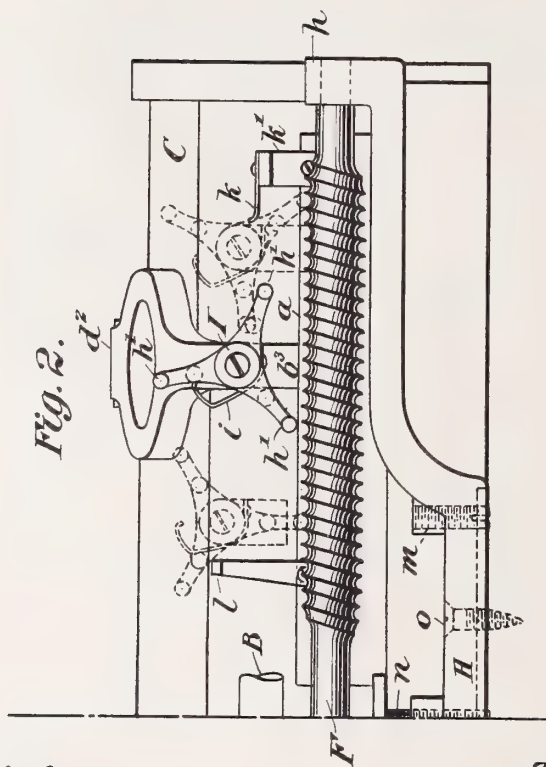


Fig. 4.



WITNESSES:

Frank S. Ober
W. D. Hedican

INVENTOR

Thomas L. Dennis Jr.

BY *Wm. H. Appert*

ATTORNEY.

UNITED STATES PATENT OFFICE.

THOMAS L. DENNIS, JR., OF BROOKLYN, NEW YORK.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 590,643, dated September 28, 1897.

Application filed April 1, 1897. Serial No. 630,256. (No model.)

To all whom it may concern:

Be it known that I, THOMAS L. DENNIS, JR., a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention, while relating to that class of machines or instruments known as "phonographs," has reference more particularly to the means made use of for causing the traveling diaphragm to return to its initial position with respect to the record-cylinder after having completed its course along the length of that cylinder, and has for its object to provide an automatically-operating switchback mechanism which at the completion of the forward travel of the diaphragm and its supporting carrier or arm shall disconnect the feeding mechanism and cause the diaphragm to rapidly resume its initial position and, if needful, to then automatically disconnect the backward-carrying devices and bring the feeding mechanism again into action.

To accomplish all of this and to secure other and further advantages in the matters of construction, operation, and use, my improvements involve certain novel and useful arrangements or combinations of parts, peculiarities of construction, and principles of operation, all as will be hereinafter more fully described, and then pointed out in the subjoined claims.

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a plan or top view of an ordinary form of phonograph, showing my improvements applied in connection therewith, the diaphragm being represented at a point near the completion of its forward course; Fig. 2, a side elevation thereof with portions at the left of Fig. 1 omitted and illustrating in dotted lines different positions assumed by the tripping mechanism; Fig. 3, an end view, partly in section and partly in elevation, showing the feeding-nut in and out of engagement with the feeding-screw and indicating the course of the belt or other connection by which the retracting-screw may be driven; and Figs. 4 and 5, side and end views, respectively, of the extremity of the diaphragm carrier or arm, the latter figure representing the spring applied

thereon and both figures omitting the revolving tripper shown in Figs. 1 and 2.

In all the figures like letters of reference are employed to designate corresponding parts.

A indicates the record-cylinder, and B the shaft through which it is rotated at the required times. This shaft is mounted on suitable centers bb or in other appropriate bearings secured to or forming parts of the bed of the machine and is provided with the usual feed-thread b' , extending throughout a portion of its length, and with a pulley b^2 at one of its ends, through which its rotation is effected from the motor or other source of power by a belt or other equivalent form of motion-transmitting devices.

Arranged in parallelism with the shaft B is a guide-rod C, upon which is fitted to slide a sleeve D. This sleeve is provided at one of its ends with the segmental nut d , that engages at the appropriate times with the feed-thread b' , and at its other with the carrier or arm d^2 , which, extending over the record-cylinder A, carries, in a suitable frame formed therein, the diaphragm E and is normally supported at its free end from the slide a on the base of the machine, when the diaphragm is being fed over the record-cylinder, by a lug or strut b^3 , depending from its under side, as shown. As thus arranged when the segmental nut d is brought into engagement with the feed-thread b' and the shaft B is rotated in the proper direction the record-cylinder will be similarly rotated and the diaphragm, with its carrier or arm, fed forward along the same, bringing the projecting stylus on its under side into engagement with the surface thereof, and thereby permitting of either the formation of appropriate indentations in such surface by the applications of the requisite vibrations to the diaphragm or of the reproduction of the tones or speech corresponding to such indentation if previously formed, as may be desired.

The several parts as thus far described, while coöperating to produce the results specified, possess no novelty in themselves, but are or may be the same as those heretofore in use and require no further description herein.

My invention, on the other hand, as above indicated, relates to the means whereby the diaphragm is caused to return to its initial

position automatically after having been fed over and along the record-cylinder A, and to this end I make use of the screw-shaft F, which is journaled in suitable bearings h ,
 5 formed in the stand H in parallel relationship to the shaft B, from which latter the shaft F is rotated through the intermediaries of the belt c and the pulleys h^3 and f , with which such shafts are respectively provided. In my
 10 preferred form of construction I find it convenient to make the screw-thread of this shaft F run in a different direction from that of the shaft B—as, for instance, make it a left-hand thread if the thread b' is a right-hand one—
 15 and to rotate the two shafts in the same direction, but this is unessential, and both of the threads may be of the same hand, in which event the two shafts will be rotated in opposite directions; but however the threads of
 20 these two shafts may be disposed with respect to one another I find it desirable to make the pitch of the thread of the screw-shaft F considerably greater than that of the thread of the shaft B, whereby to insure of a
 25 greater speed of travel of the diaphragm when moving back to its initial position under the operation of the former thread.

Coöperating with the screw-shaft F is a tri-armed tripper I, the arms of which are similar
 30 and preferably disposed at equal distances apart around its axis. This tripper is pivoted to the free end of the carrier or arm d^2 , which is extended sufficiently beyond the supporting lug or strut b^3 to bring the former approximately over the axis of the shaft F and
 35 is provided at its extreme end with an up-turned ear b^4 for reception of the screw b^5 , upon which such tripper is pivoted.

In the construction of the tripper the arms
 40 are made of such length that when either is forced into a vertical position and is in engagement with the thread of the screw-shaft F it will elevate the free end of the carrier or arm d^2 with the diaphragm and other attach-
 45 ments to such an extent as to make them clear the record-cylinder during their retracting movement and at the same time disengage the segmental nut d from engagement with the feed-thread b' of the shaft B, as indicated
 50 in dotted lines in Fig. 3. As thus constructed and arranged the plane of rotation of the tripper is approximately coincident with a plane passing longitudinally through the axis of the shaft F, and in order to insure the
 55 proper engagement of its arms with the thread of such shaft I find it convenient to equip each of their extremities with a short transversely-arranged cylindrical portion h' , which is provided with a circular notch h^3 in its side,
 60 whereby to straddle and receive the upper portion of the thread of the screw-shaft F, as shown in Fig. 1.

In addition to the transversely-arranged cylindrical portion h' each of the arms of this
 65 tripper is likewise provided with a pin h^4 , projecting outwardly from its rear side for coöperation with the holding-spring i , which is se-

cured to the under side of the free end of the carrier or arm d^2 , in close relationship to the plane of rotation of the inner face of the tripper, by a screw i' . As thus disposed each of
 70 the pins h^4 will be brought into engagement with the spring i in succession as the tripper is rotated upon its pivot and the movement of the same arrested until the spring is bent
 75 inward away from the path of travel of said pins, when such rotation will be resumed, and so on.

With the tripper I and spring i are employed stops k and l , the former of which is
 80 made in the form of a plate-spring and is supported from some convenient part of the machine, as from the base-plate thereof, in line with the travel of the tripper, by a stand k' , while the latter is preferably made from a
 85 rigid bar in L shape and so secured to the base-plate of the machine as to bring the extremity of its free end into and slightly across the line of travel of the spring i .

The several parts being constructed and
 90 arranged, as above explained, with the tripper I in the position shown in full lines in Fig. 2, the operation of the machine will be as follows: On rotating the shaft B in the proper
 95 direction the record-cylinder will be similarly rotated and the diaphragm carried over and along the same until the upper surface of the arm of the tripper I that is in advance is brought into contact with the under side of the spring-stop k and the tripper so rotated
 100 thereby as to force the extremity of that arm down into engagement with the thread of the screw-shaft F, or into the positions shown by dotted lines at the right of Fig. 2. The arm of the tripper having been thus brought into
 105 engagement with the thread of this screw will be carried along with it as such shaft is rotated and the tripper rotated upon its axis until such arm is carried into a vertical position, or into the position shown by dotted lines
 110 at the left of Fig. 2, the result of which will be to raise the free end of the carrier or arm d^2 with the diaphragm and thereby disengage the segmental nut d from the thread b' of the shaft B and stop the further feeding of the
 115 diaphragm along the record-cylinder. The arm of the tripper engaged with the screw-shaft F having been carried thereby into a vertical position, the pin h^4 of the next preceding arm of the tripper in the direction of
 120 its rotation will be brought into contact with the spring i , the resistance of which is sufficient to prevent the further turning of the tripper. As a consequence of this the elevated diaphragm, with the tripper and the seg-
 125 mental nut, will be carried back until in its backward movement the spring i is brought into contact with the free end of the stop l , when the further backward movement of the parts will cause the said spring to move in-
 130 ward, releasing the pin h^4 from engagement therewith and allowing of the rotation of the tripper upon its axis, together with the disengagement of the arm of the tripper from

the thread of the screw-shaft F and the return of the diaphragm and the other parts to their normal positions, with the segmental nut into engagement with the thread *b'* of the shaft B ready for another forward movement, and so on.

In some instances I find it convenient to secure the stand H fixedly to the bed of the machine. I prefer, however, to provide for its vertical adjustment, whereby to insure of the proper engagement and disengagement of the segmental nut with the thread *b'* of the shaft B by the operation of the tripper I, and for this purpose I make use of the adjusting-screws *m* and *n*, the former of which I preferably insert into threaded orifices upward from the under side of the stand and the latter of which is provided with a milled head and is inserted downward from the upper side of such stand, as shown. When this arrangement of adjusting-screws is employed, I find it desirable to secure the stand H to the base of the machine by a screw *o*, passing down through the center of the former and engaging with its free end the base below.

From the foregoing it will be seen that the improvements are simple in construction, efficient in operation, and well calculated to answer all the purposes or objects of the invention hereinbefore alluded to.

Although in the foregoing I have described the best means contemplated by me for carrying my invention into practice, I wish it distinctly understood that I do not limit myself strictly thereto, but reserve to myself the right to modify the same in various ways without departing from the spirit thereof.

Having now fully described my invention and specified certain of the ways in which it is or may be carried into effect, I claim as new and desire to secure by Letters Patent—

1. In a phonograph, a rotatable tripper combined with the diaphragm-carrier, and a stationary stop, with which such tripper engages and is rotated to effect the elevation of the carrier at the completion of its forward travel, substantially as and for the purposes set forth.

2. In combination, with the diaphragm-carrier having a rotatable tripper, a screw-

shaft for returning the carrier, and means substantially as described for compelling the tripper to rotate and engage with the shaft at the time, and substantially in the manner, set forth.

3. The diaphragm-carrier, a revolving tripper mounted thereon, a stationary stop having a spring for turning the tripper, and a threaded shaft for engaging an arm of said tripper and moving the same, the parts being combined substantially as shown and described.

4. In combination, with the revolving tripper mounted on an arm of the diaphragm-carrier, a resistance-spring also mounted on said arm and arranged to bear against a pin or projection on the tripper to limit its movement, substantially in the manner and for the purposes set forth.

5. The revolving tripper having the pins or projections, a resistance-spring for bearing against either of the pins, and a stop against which the spring is borne to release the pin, combined and arranged for operation substantially as described and for the purposes set forth.

6. In a phonograph, a feeding-screw, feeding-nut, diaphragm-carrier, an automatically-operating switching and tripping mechanism applied on said carrier, and revolving threaded shaft for engaging the tripper and retracting the diaphragm-carrier, combined and arranged substantially as set forth.

7. In a phonograph, the combination with the diaphragm-carrier, an automatic tripping and switching device applied thereon, and the revolving shaft for carrying the tripper backward, of means substantially as described for automatically disengaging the tripper from the said shaft, thereby lowering the diaphragm-carrier and bringing the feeding mechanism into action, substantially as and for the purposes set forth.

In testimony whereof I have hereunto set my hand this 27th day of March, 1897.

THOMAS L. DENNIS, JR.

Witnesses:

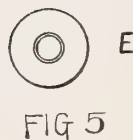
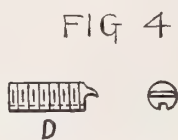
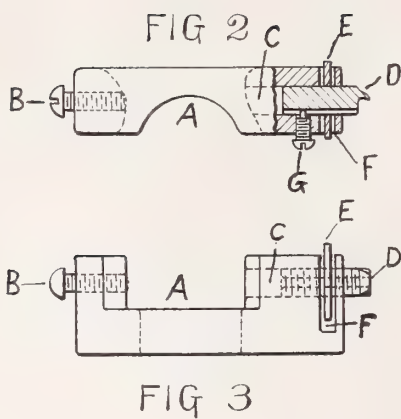
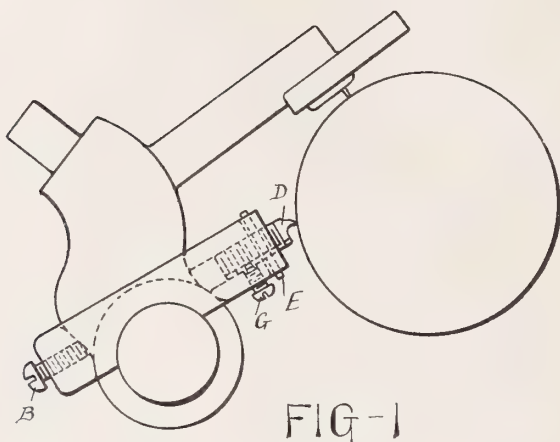
FRANK S. OBER,
R. F. SWEENEY.

(No Model.)

E. E. BARDSLEY.
ATTACHMENT FOR GRAPHOPHONES.

No. 592,758.

Patented Nov. 2, 1897.



WITNESSES:

Winfield S. Bardsley.
B. Frank Rittenhouse

INVENTOR

Edward E. Bardsley

UNITED STATES PATENT OFFICE.

EDWARD E. BARDSLEY, OF PHILADELPHIA, PENNSYLVANIA.

ATTACHMENT FOR GRAPHOPHONES.

SPECIFICATION forming part of Letters Patent No. 592,758, dated November 2, 1897.

Application filed March 5, 1897. Serial No. 626,173. (No model.)

To all whom it may concern:

Be it known that I, EDWARD ELMER BARDSLEY, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Shaving Attachments for Graphophones, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention relates to that class of shaving attachments for graphophones in which the cutter-bar or shank is operated by a screw.

In previous devices the attachment is fastened to the rounded part of the carrier of the graphophone, which brings the cutter-bar of the attachment a considerable distance from the center of the carrier. To overcome this, the cutter-bar has a lug at its end to which the cutter is fastened. The regulation is effected by pushing the cutter up against the cylinder to be shaved and held in position by a set-screw, thereby not allowing very perfect adjustment, especially when the cylinder is not perfectly true.

The objects of my invention are, first, to provide a shaving attachment for graphophones in which the cutter can be perfectly adjusted while the cylinder and carrier of the graphophone are in motion, thereby avoiding all danger of cutting too deep into the cylinder, as when regulated by pushing cutter forward by hand; second, to provide a less complicated and cheaper device; third, a device that may be left on the graphophone at all times without interfering with its action. I attain these objects as follows:

In the accompanying drawings, Figure 1 is the device as attached to the carrier of the graphophone. Fig. 2 is a side view, partly in section; Fig. 3, a sectional top view; Fig. 4, a view of the cutter with grooved and threaded shank, also end view showing groove and cutting edge; Fig. 5, the adjusting-nut.

Similar letters refer to similar parts throughout the several views.

The clutch or clamp A, forming the body of the device, has a clutch-screw B, which firmly

holds the device in position on the carrier of the graphophone. At the opposite end of the clutch A and in line with the clutch-screw B is bored a guide-hole C, into which the grooved and threaded shank of the cutter D may freely move. The cutter D may be adjusted by revolving the adjusting-nut E, which fits on the threaded shank of the cutter D. The adjusting-nut E is prevented from moving out of position by the walls of the slot F of the clutch A.

The cutter D is kept from rotating by a groove running lengthwise along its shank, into which is fitted the guide screw or pin G, as shown in Fig. 2.

In practical operation this device is attached to the carrier of the graphophone, as shown in Fig. 1. Having previously moved the cutter D back into the guide-hole C as far as possible and having placed a cylinder to be shaved on the graphophone, the cutter is then brought into position by the adjusting-nut E to shave off the desired thickness and the graphophone started, as in recording and reproducing, or the graphophone can be first started and cutter adjusted afterward, especially when the cylinder is out of true. After the cylinder is finished the cutter D can be withdrawn as far as possible from the cylinder, and the device may be left in that position without interfering with the operation of the graphophone.

Having thus described my invention, I claim and desire to secure by Letters Patent—

In a shaving attachment for graphophones, a body or clutch A, with a clamp-screw B, and a cutter D, with grooved and threaded shank, an adjusting-nut E, a guide screw or pin G, to operate substantially as heretofore set forth and described.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

EDWARD E. BARDSLEY.

Witnesses:

WINFIELD S. BARDSLEY,
B. FRANK RITTENHOUSE.

(No Model.)

2 Sheets—Sheet 1.

A. C. FERGUSON.
MACHINE FOR REPRODUCING SOUND.

No. 595,053.

Patented Dec. 7, 1897.

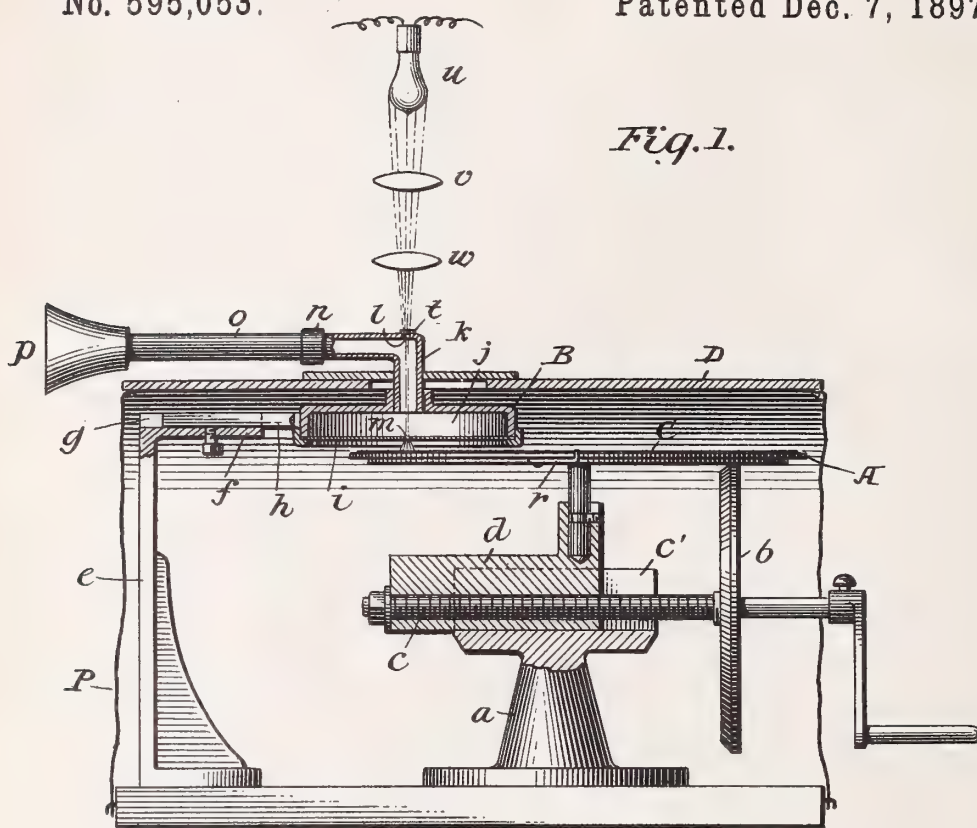
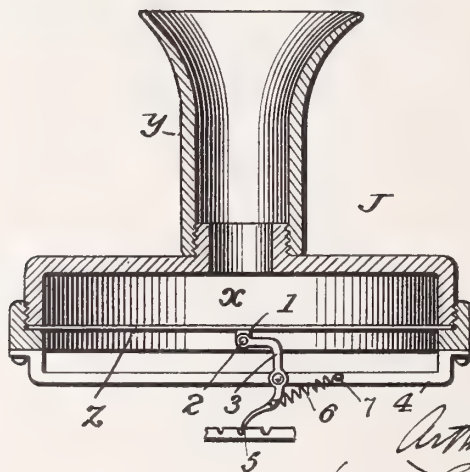


Fig. 1.

Fig. 4.



Witnesses
J. H. Hinkel
E. C. Brown

Inventor
Arthur C. Ferguson
by *John H. Hinkel*
Attorneys

(No Model.)

2 Sheets—Sheet 2.

A. C. FERGUSON.
MACHINE FOR REPRODUCING SOUND.

No. 595,053.

Patented Dec. 7, 1897.

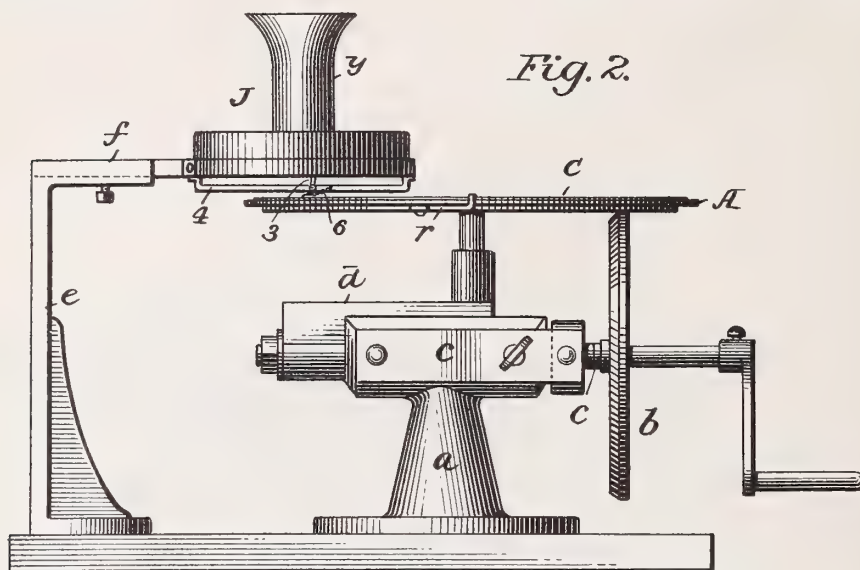
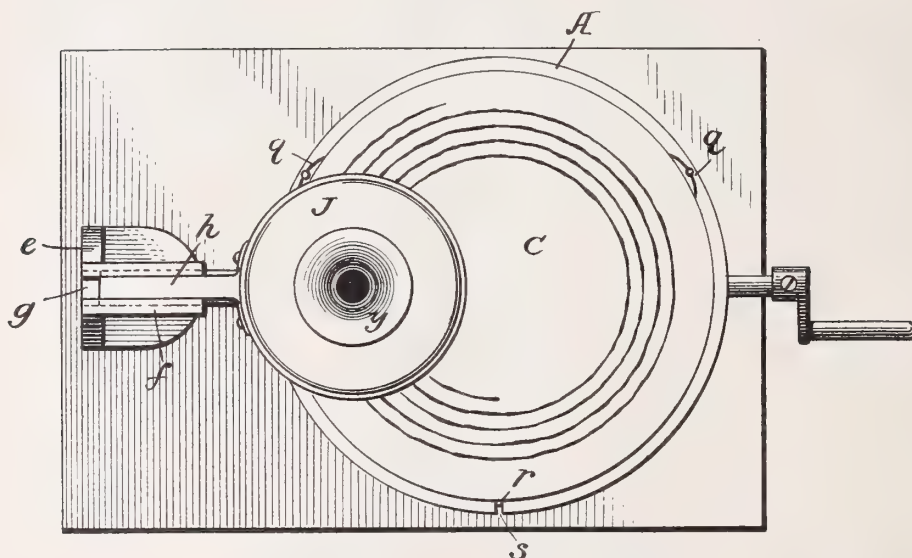


Fig. 3.



Witnesses
J. Hinkel
Ernest E. Allen

Inventor
Arthur C. Ferguson
by *Forster & Loomis*
Attorney:

UNITED STATES PATENT OFFICE.

ARTHUR C. FERGUSON, OF BROOKLYN, NEW YORK.

MACHINE FOR REPRODUCING SOUND.

SPECIFICATION forming part of Letters Patent No. 595,053, dated December 7, 1897.

Application filed April 17, 1897. Serial No. 632,646. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR C. FERGUSON, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Machines for Reproducing Sound, of which the following is a specification.

This invention relates to certain new and useful improvements in means for recording and reproducing sound-waves; and it consists, substantially, in such features of construction, arrangement, and combination of parts as will hereinafter be more particularly described.

The invention has reference more particularly to that class of devices or apparatus in which the original impulses or vibrations produced by sound-waves are first recorded photographically and subsequently reproduced mechanically; and the invention is intended as an improvement upon the invention covered by my former Letters Patent No. 539,254, granted May 14, 1895, although in some respects the present invention involves totally distinct and independent features of improvement. In the practice of the invention covered by the Letters Patent aforesaid I employ a gradually-progressive sensitized film carried by a rotating cylinder, and combined with the cylinder is an inclosing case and a vibrating shutter operating before an opening in the case by which the ray or beam of light entering the opening will be photographed upon the film in sinuous or undulating lines. After being thus utilized to record the sound the film is developed by the ordinary photographic process, and then in order to reproduce the sound-waves delineated thereon the lines are transferred in any suitable way upon a corresponding cylinder which is placed in the machine and progressively rotated while a reproducing-needle engages in the lines on the cylinder, the said needle being caused to vibrate in contact with a reproducing-diaphragm.

In the present instance I dispense with the cylinder for various reasons, and in its place I substitute a progressively-moving rotating disk, and I also dispense with the movable

or vibrating shutter, as well as the inclosing case provided with an opening before which the shutter is caused to operate. The principal object of the present invention is to overcome all resistance and impediment to an accurate record and reproduction of the sound-waves, as well as to simplify the construction and to adapt the invention to different uses and purposes for which the cylinder could not well be employed. These and other objects I attain by the means illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional elevation representing the construction and arrangement of devices for recording the sound-waves, and Fig. 2 is a similar view indicating the construction and arrangement employed for reproducing the sound-waves. Fig. 3 is a top or plan view, and Fig. 4 is a view in detail of the reproducer and its diaphragm.

My present invention is capable of a great many different embodiments, and while I have herein represented a certain preferred embodiment it will be understood that I am not limited thereto, but that I am at liberty to make such immaterial changes in the general construction and arrangement of parts as may be demanded by the exigencies of any particular case.

In the practice of my present invention the sound-waves are recorded upon the surface of the film or plate in continuous lines which vary in thickness or width, and this record is produced entirely by the variation in the degree of divergence of the light-rays between the contiguous surfaces of the plates and the recording-diaphragm. For instance, I arrange the recording-diaphragm in proper relation to the sensitized plate upon the disk, and I project a concentrated ray or beam of light upon the plate through an opening in the diaphragm, and then by talking into the diaphragm the same will be caused to vibrate, and as it moves nearer to or farther from the plate the degree of divergence of the light-rays will change, and consequently the lines produced upon the plate will vary in width to a corresponding degree. The deeper the sound directed against the diaphragm the

narrower will be the line produced upon the plate, while the farther the diaphragm remains from the plate the wider will be the line.

My invention will be more fully understood on reference to the accompanying drawings, in which—

A represents a rotating disk which is mounted in a suitable support having a base *a*, and said disk while capable of being rotated in different ways is preferably rotated by means of a friction-wheel *b*, bearing against its under surface near the edge and carried by a screw-shaft *c*, which is operated by hand or in any other suitable manner. In order to impart to the disk a gradual or progressive lateral movement independent of its rotation, the support for the disk comprises in part a longitudinally-slotted bracket *c'*, carrying a traveler *d*, in which works the screw-shaft *c*, and it is obvious that as the said shaft is revolved the disk will not only be rotated, but will be caused to move laterally in a gradual or progressive manner. Other means could be employed for imparting these movements to the disk with equal effect and still be within my invention.

Extending upward from the base to a suitable height is a standard *e*, which carries at right angles thereto a guide arm or bracket *f*, provided with a dovetailed groove *g*, in which is held and is longitudinally adjustable a slide *h*, to the end of which is attached or secured in any suitable manner the recorder or transmitter B, having the diaphragm *i*, which is of very sensitive opaque material, so as to be susceptible to vibration from very light sounds or tones projected against the same. The said recorder or transmitter is constructed of an ordinary circular hollow case or box *j*, from which extends a hollow arm or projection *k*, having in its upper part a small or fine opening *l*, which is in direct alinement or coincidence with a similar opening *m*, formed in the recording-diaphragm. The said arm *k* is bent or curved to one side, as shown, and attached thereto in any suitable manner at *n* is a speaking-tube *o*, of any suitable material, either flexible or rigid, and provided with a trumpet or mouthpiece *p*. The post or standard *e* is located far enough to one side of the rotating disk A to permit the full radial progressive movement of the latter, and by means of the adjustable slide *h* the diaphragm B may be carried to any desired point in the radius of the disk at which to begin operations, as is obvious.

The sensitized plate is represented at C, and the same is also circular in form, and while it could be held in place upon the disk in different ways I prefer the use of small spring-clamps *q*, arranged at opposite points on the disk at the edges, and a spring locking-arm *r*, secured to the under side of the disk and working in a notch *s*, so as to bear upon the edge of the film. The plate or film itself is of a hard substance—as, for instance, like the

well-known Kraemer plates—and it is clear from the means described and shown that the said plate will be held in position on the disk against movement with respect to the latter.

The interior of the hollow arm projecting upward from the box or case of the recorder or transmitter B is blackened by the application of paint, lampblack, or other similar substance, and the entire apparatus is inclosed by an outer sheath or covering D, comprising, preferably, a metallic hood, to the ends of which flexible curtains P are attached, so as to admit of the proper movement of the disk as well as ready and convenient access. This covering D is blackened on its inner surface and the curtains are of some dark material to prevent the access of light upon the film or sensitive plate, so that a dark chamber is practically thus constituted. The arm *k* projects through said sheath or covering D, and it should be stated that in order to have no leakage in the speaking-tube the opening *l* in said arm is closed by a glass plate *t*, which prevents the escape of sound from the tube, while still permitting the passage of the light to the opening in the diaphragm.

I employ, preferably, an artificial light—say an electric light *u*—and I also use two object glasses or lenses *v w*, by means of which the rays of light are concentrated or brought to a focus immediately at the opening closed by the glass *t*, and it is obvious that as the concentrated ray or beam emerges through the opening *m* in the diaphragm there will be a greater or a lesser divergence of the light-beam proportionate to the distance between the diaphragm and the surface of the sensitive plate. By speaking or otherwise directing a sound into the speaking-tube and onto the diaphragm the latter will be caused to vibrate, and according to the amplitude of the vibrations the lines photographed on the plate will be thin or heavy.

When the sensitized plate or film has been utilized to the desired extent, the light is cut off and the plate is removed to a photographic dark chamber, where it is developed in the usual way, and then the lines on the plate are transferred by any suitable method onto the surface of a hard-rubber or celluloid disk or plate, and when it is desired to reproduce the sound-waves this rubber or celluloid disk is placed in the machine and operated upon in the manner about to be described.

Many different forms of reproducers could be employed; but preferably I resort to the use of any ordinary or well-known receiver J, (shown in Fig. 2,) and which consists of a case *x*, having a tube *y* leading therefrom, and a diaphragm *z*, arranged in place in any suitable manner. Cemented or otherwise secured to the under side of said diaphragm *z* is a thin metallic lug or projection 1, to the side of which is movably secured at 2 the upper end of a small curved arm or lever 3, which is pivoted to an arm 4, extending between the

sides of the case across the diaphragm, but free or out of contact with the latter. The lower end of said reproducing arm or lever 3 is sharpened at 5, so as to be received into the sunken lines on the hard-rubber disk, and the arm is acted upon by a spring 6, so as to be drawn to one side and cause the point thereof to bear against one wall of the said lines in such manner that an accurate reproduction of the sound-waves will be had. The said spring is fastened at one end to the lever 3 and at the other end to the arm 4, and the lever 3 is pivoted to the side of said arm, as indicated at 7, and the operation of said spring 15 and lever will be readily understood.

To obtain a reproduction from one of the rubber disks after proper transference of the lines thereto, the said disk is placed upon the rotating disk A and the proper adjustments 20 of the reproducing-diaphragm made. The sharp end of the reproducing arm or lever 3 is then properly inserted at the beginning of the lines. The disk A is then rotated, and the motions of said arm or lever 3 will impart 25 corresponding vibrations in the diaphragm z, and in this way there will be an exact reproduction of the sound-waves. It is only necessary that the end of the lever follow one side or wall of the lines and the spring 6 tends 30 to always maintain the same in true relation.

In effecting the reproduction it is of course apparent that there is no necessity for using the covering D or curtains P, which are removed temporarily, or else the entire machine 35 may be removed from beneath the same.

It is of course understood that any means could be employed for transferring the lines produced on the sensitive plate to the surface of the disk of rubber or celluloid, and in these 40 and other respects I am not limited in any manner whatever while carrying my invention into effect. The details of construction of the several parts could also be varied, and, therefore, without confining myself to the precise construction and arrangement of parts 45 shown and described

I claim—

1. In means for recording and reproducing sound-waves, the combination of a gradually- 50 progressive rotating sensitized film or plate, a recording-diaphragm in proximity to said

film or plate, and having a central opening, and means for directing a ray or beam of light onto the plate through the opening, substantially as described. 55

2. In means for recording and reproducing sound-waves, the combination of a gradually- progressive rotating sensitized film or plate, a recording-diaphragm in proximity to said film or plate, and having a central opening, 60 a tube leading from the diaphragm and having an opening coinciding with the opening in the diaphragm, and means for directing a ray or beam of light onto the plate through the openings, substantially as described. 65

3. In means for recording and reproducing sound-waves, the combination of a gradually- progressive rotating disk, a sensitized plate or disk held thereon, a recording-diaphragm in proximity to said film or plate, and having 70 a central opening, means for directing a ray or beam of light onto the plate through the opening, and means for directing sound-waves onto the diaphragm, substantially as described. 75

4. In means for recording and reproducing sound-waves, the combination of a gradually- progressive rotating sensitized film or plate, a recording-diaphragm in proximity thereto having a central opening, means for direct- 80 ing a ray or beam of light onto the plate through the opening, and means for directing sound-waves onto the diaphragm, substantially as described.

5. In means for recording and reproducing 85 sound-waves, the combination of a gradually- progressive rotating sensitized film or plate, a recording-diaphragm in proximity to said film or plate and having a central opening, a speaking-tube leading from the diaphragm 90 and having a coinciding opening closed by a glass plate, and means for directing a ray or beam of light onto the plate through said openings, substantially as described.

In testimony whereof I have signed my 95 name to this specification in the presence of two subscribing witnesses.

ARTHUR C. FERGUSON.

Witnesses:

E. EVERETT ELLIS,
HENRY J. GROSS.

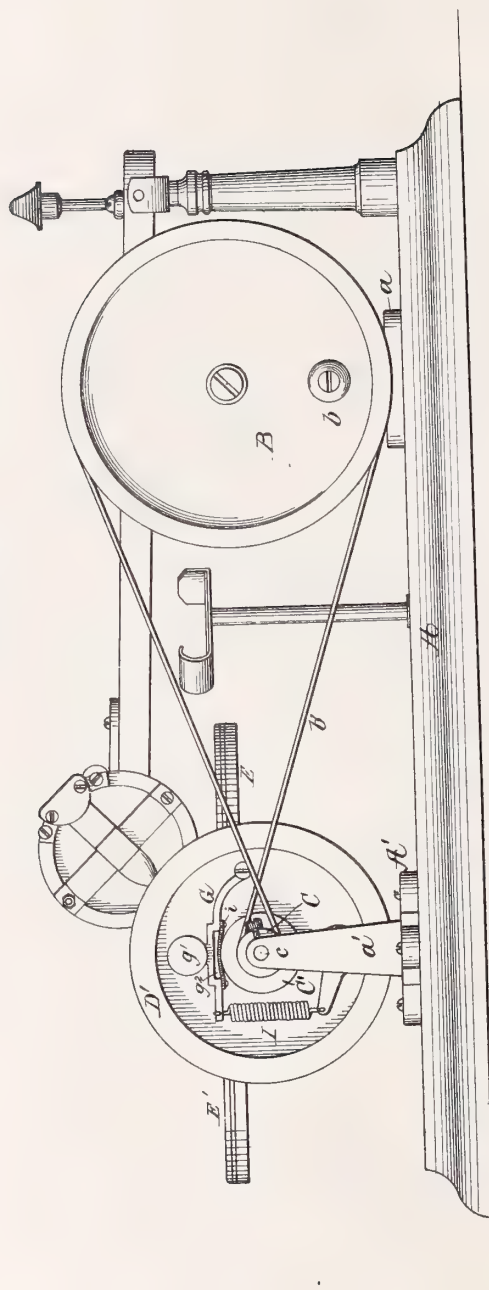
(No Model.)

3 Sheets—Sheet 1.

A. C. CLARK.
GRAMOPHONE.

No. 597,875.

Patented Jan. 25, 1898.



Witnesses:
Charles L. Cow
Murray C. Boyer

Inventor:
Alfred Corning Clark
by his Attorneys,
Howson & Howson

(No Model.)

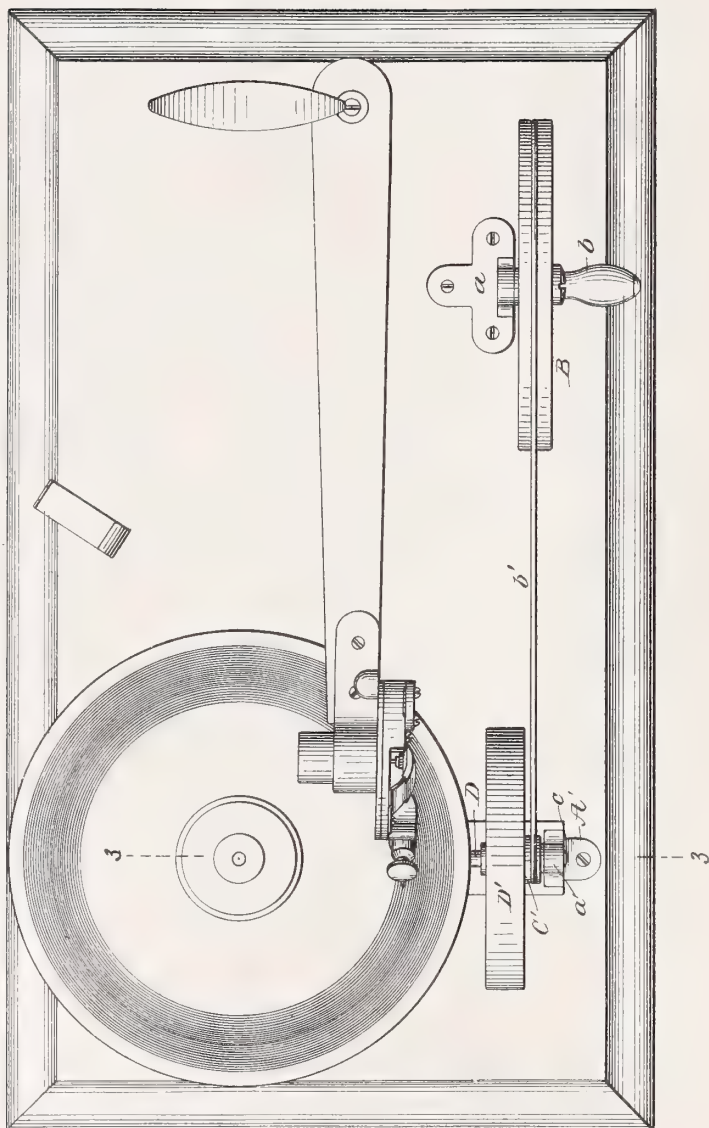
3 Sheets—Sheet 2.

A. C. CLARK.
GRAMOPHONE.

No. 597,875.

Patented Jan. 25, 1898.

FIG. 2.



Witnesses:
Charles De Cou
Murray C. Boyer

Inventor:
Alfred Corning Clark
by his Attorneys,
Houson & Houson

(No Model.)

3 Sheets—Sheet 3.

A. C. CLARK.
GRAMOPHONE.

No. 597,875.

Patented Jan. 25, 1898.

FIG. 4.

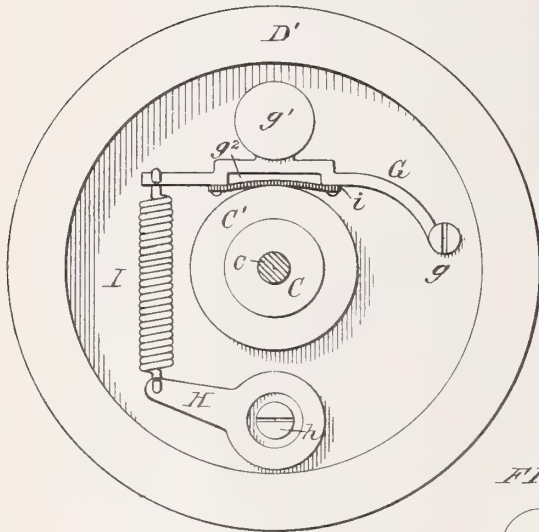


FIG. 5.

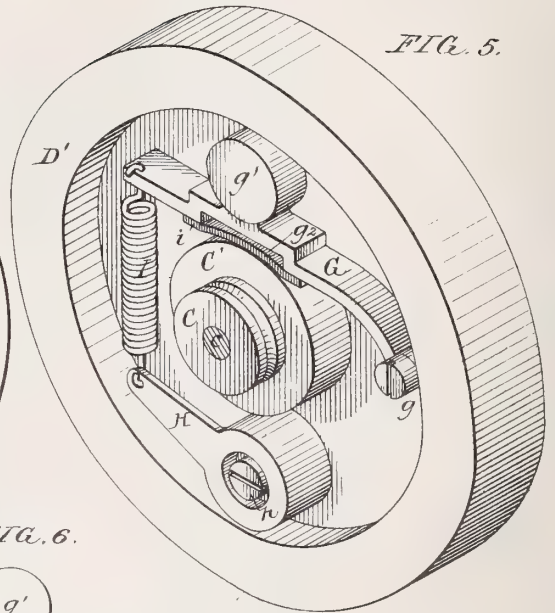


FIG. 6.

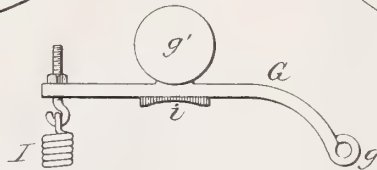
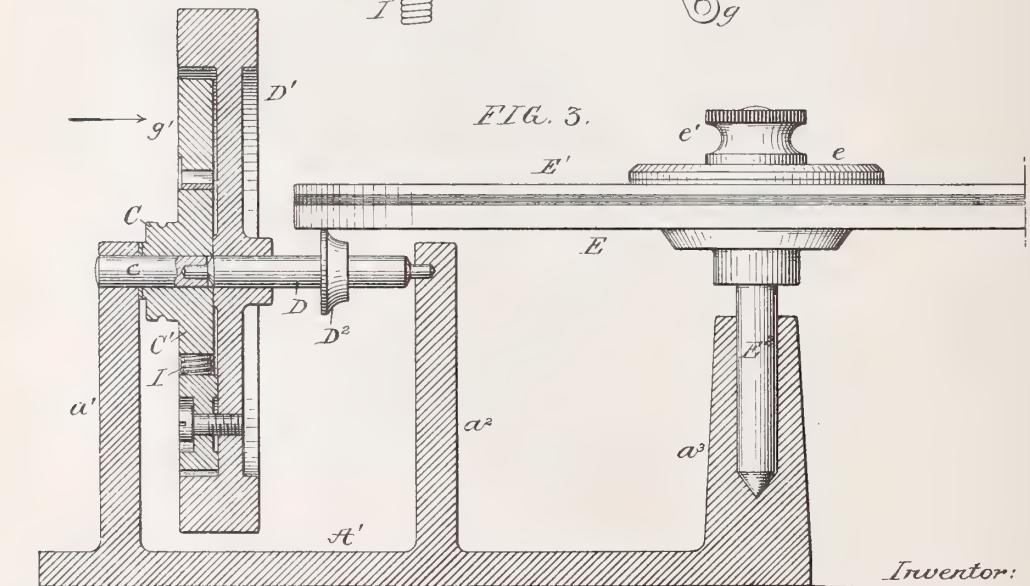


FIG. 3.



Inventor:

Alfred Corning Clark
by his Attorneys,
Howson & Howson

Witnesses:

Charles De Gou.
Murray Boyer

UNITED STATES PATENT OFFICE.

ALFRED CORNING CLARK, OF NEW YORK, N. Y., ASSIGNOR TO THE UNITED STATES GRAMOPHONE COMPANY, OF WASHINGTON, DISTRICT OF COLUMBIA.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 597,875, dated January 25, 1898.

Application filed December 4, 1896. Serial No. 614,487. (No model.)

To all whom it may concern:

Be it known that I, ALFRED CORNING CLARK, a citizen of the United States, and a resident of New York city, New York, have invented certain Improvements in Gramophones, of which the following is a specification.

The object of my invention is to regulate the speed of the record-tablet of a gramophone in such a manner that uneven turning of the driving mechanism will not affect the tablet, so that the instrument will reproduce in an even tone the sounds recorded on the tablet. This object I attain in the following manner, reference being had to the accompanying drawings, in which—

Figure 1 is a side view of a gramophone, illustrating my invention. Fig. 2 is a plan view. Fig. 3 is a sectional view on the line 3 3, Fig. 2. Fig. 4 is a view of the fly-wheel, looking in the direction of the arrow, Fig. 3. Fig. 5 is a perspective view of the fly-wheel, and Fig. 6 is a view of a modification of the brake.

My invention is shown in connection with a gramophone for which Letters Patent were granted to Emile Berliner on February 19, 1895, No. 534,543.

A is the base of the machine, on which is mounted the bearing *a* for the driving-wheel B, which has a crank-handle *b* to be grasped by the operator. This driving-wheel is grooved for the reception of a driving-band *b'*, which passes around a small grooved pulley C, having a friction-disk C'. This pulley is mounted loosely on a stud *c*, secured to a post *a'*, projecting from a plate A', mounted on the base A.

D is a shaft having reduced journals, one journal being adapted to an opening in the end of the stud *c*, while the opposite journal is adapted to a post *a''*, projecting from the plate A', Fig. 3.

Secured to the shaft D is a fly-wheel D', and also on this shaft is the friction-wheel D'', which is in frictional contact with the revolving table E, on which is mounted the record-tablet E'. The table is mounted on a vertical shaft E'', adapted to a deep bearing in the standard *a''*, which projects from the plate A'. The record-tablet is clamped to the table in the ordinary manner by the washer *e* and nut *e'*.

Pivoted at *g* to the face of the fly-wheel D' is an arm G, preferably provided with a weight

g'. To the end of this arm is attached a spring I. The opposite end of this spring is attached to an arm-H, secured to the face of the fly-wheel by a clamp-screw *h*. The head of this arm also acts as the counterbalance-weight for the arm G. I preferably recess the arm G at *g''* and stretch across the space friction material, such as leather, which will rest upon the friction-disk of the driven pulley C; but the arm may be made, as shown in Fig. 6, with simply a piece of rubber or felt substituted for the friction-piece *i*. The arm H is so set and the tension of the spring is such that the arm G will, owing to the centrifugal force, move away from the disk and thus break the connection between the fly-wheel and the driving-wheel, so that no matter how irregular the operator turns the driving-wheel the speed of the fly-wheel and the table will always remain the same, providing there is sufficient speed in the first instance to give the proper results.

It is impossible for any one to evenly drive the machine with a small driving-wheel and crank-handle, which is necessary to produce the best results. The record is placed upon the tablet when it is driven at a regular speed, and if the speed of the machine in reproducing is increased or diminished the sound-waves will vary to such an extent that the reproduction will be very imperfect, and in a machine of this character means must be provided whereby any one who undertakes to turn the driving-wheel will reproduce the recorded sounds in the best possible manner. This I accomplish by placing between the driving mechanism and the table mechanism which will govern the rotation of the table.

It will be understood that the mechanism shown may be modified without departing from my invention, and it may be placed in a different position; but the governing mechanism must be between the driving mechanism and the driven table or tablet, so that the speed of the tablet will not be affected by the uneven turning of the driving mechanism.

I claim as my invention—

1. The combination in a gramophone, of the driving mechanism, a rotatable table on which the record-tablet is mounted, a driven shaft, a flanged fly-wheel thereon, a driven

wheel extending within the flange of the fly-wheel and a governor mounted on the fly-wheel within the flange and resting upon an extension of the driven wheel, substantially as described.

5 2. The combination in a gramophone, of the handled driving-wheel, a pulley driven thereby, said pulley having an extension in the form of a friction-disk, a fly-wheel, a
10 weighted arm pivoted to the side of the fly-wheel and adapted to rest upon the periphery of the friction-disk, a spring tending to draw the arm toward the friction-disk and a table for the record-tablet driven by the fly-wheel,
15 substantially as described.

3. The combination of the driving mechanism consisting of a rotated disk, a driven element through which the tablet-table is rotated, a pivoted arm on said element having
20 a cut-away portion and a strap extending

across the cut-away portion adapted to rest upon the surface of the driving element, substantially as described.

4. The combination of the driving element consisting of a disk, a driven element, the rotated tablet-table connected to the driven element, a pivoted arm having a friction-surface
25 adapted to rest upon the driving element, a pivoted arm attached to the driven element, a spring extending from one arm to the other
30 and means for locking the said arm in the adjusted position, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALFRED CORNING CLARK.

Witnesses:

HENRY HOWSON,
WILL. A. BARR.

(No Model.)

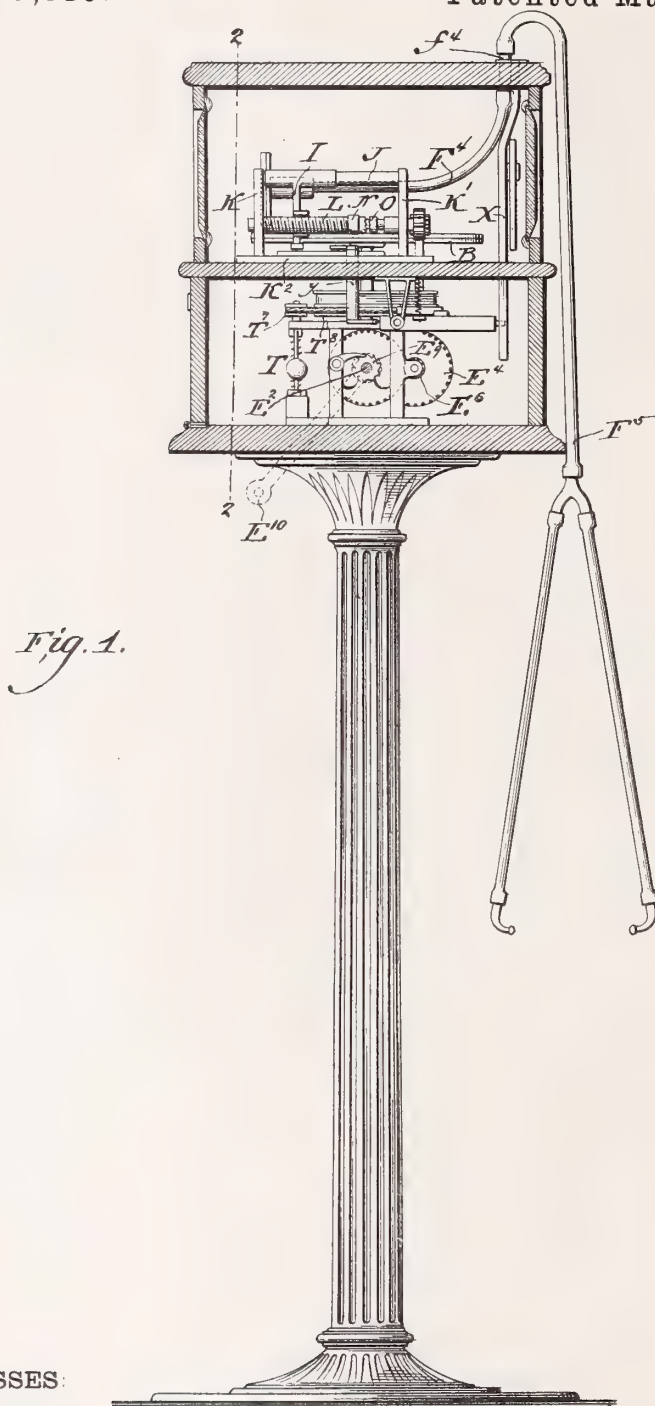
4 Sheets—Sheet 1.

J. W. JONES.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

No. 600,315.

Patented Mar. 8, 1898.



WITNESSES:

H. Stewart
Robert H. Lloyd

INVENTOR

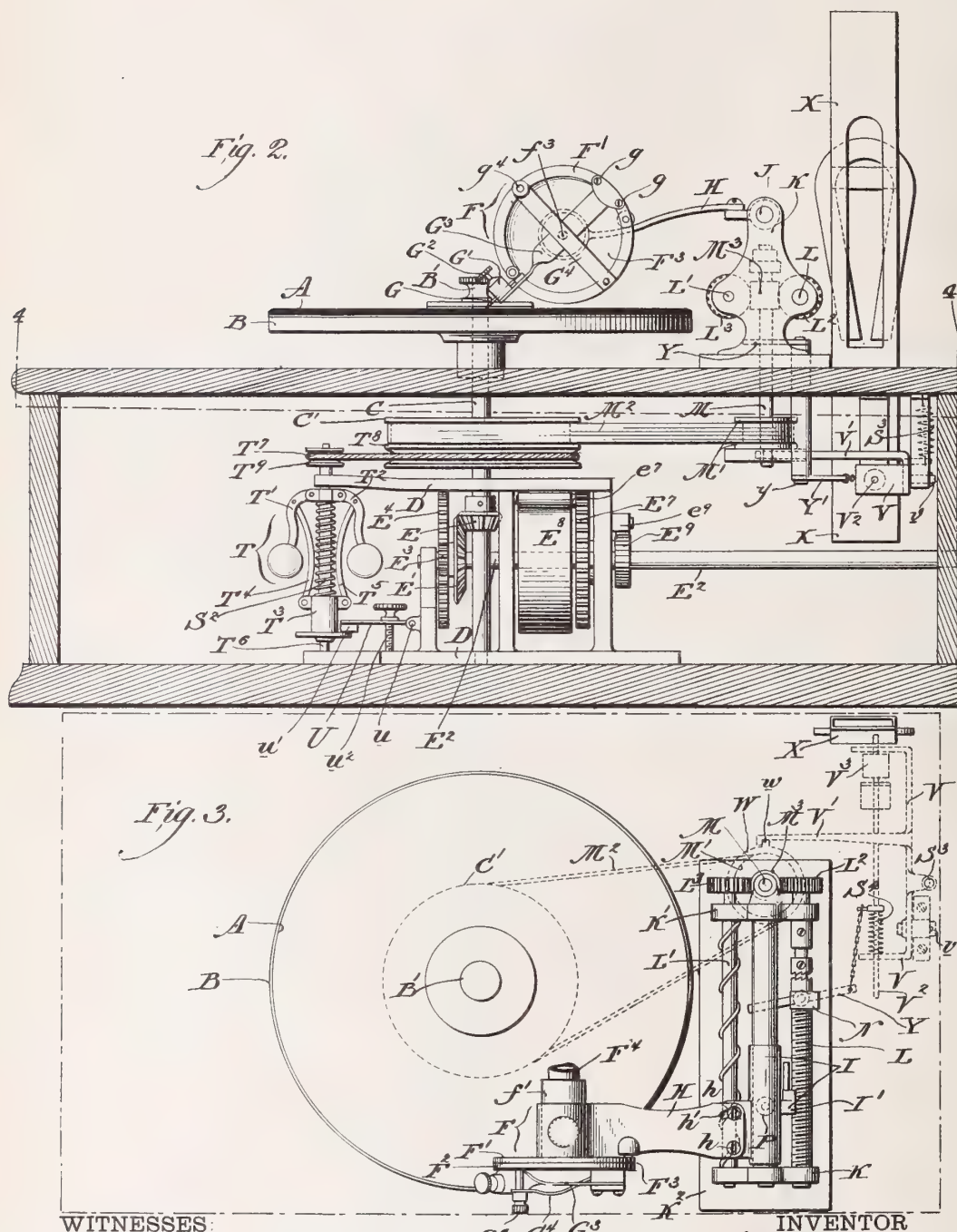
Joseph W. Jones
By David S. Williams
Attorney

J. W. JONES.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

No. 600,315.

Patented Mar. 8, 1898.



WITNESSES:

Sheworth
Robert W. Lloyd

INVENTOR

Joseph W. Jones
by *David B. Williams*
Attorney

(No Model.)

4 Sheets—Sheet 3.

J. W. JONES.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

No. 600,315

Patented Mar. 8, 1898.

Fig. 4.

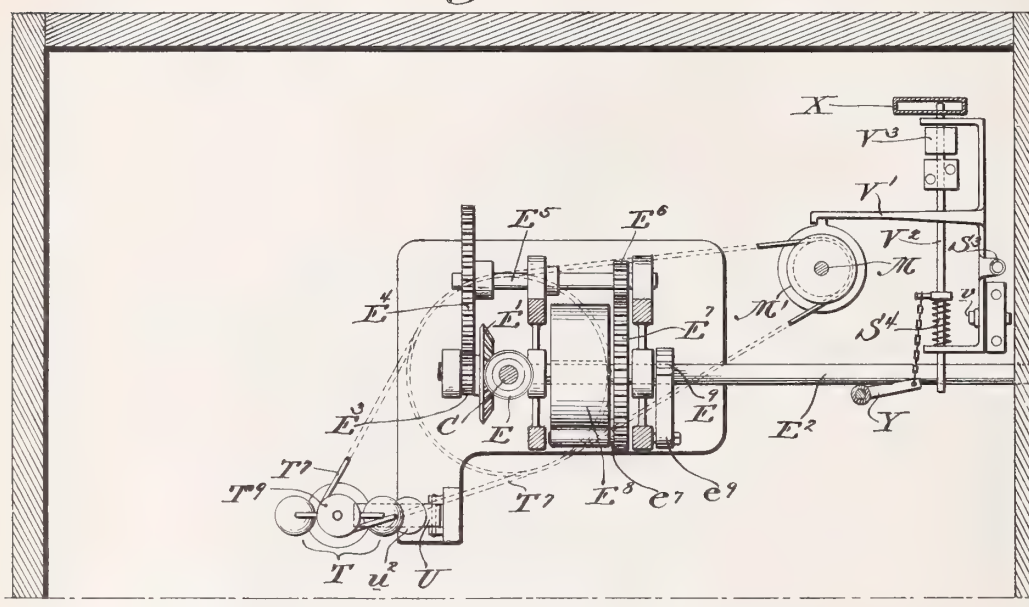
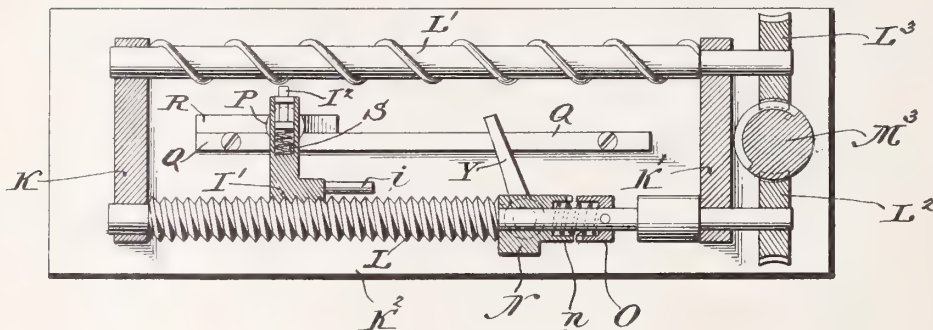


Fig. 5.



Witnesses.

Skinner
Robert W. Lloyd

Inventor.

Joseph W. Jones
by David S. Williams & Co.

Attorney.

(No Model.)

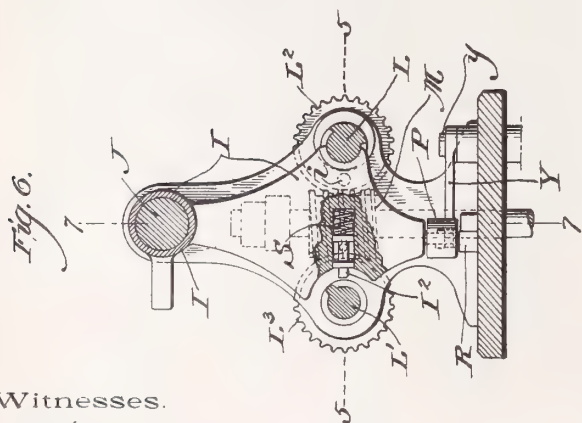
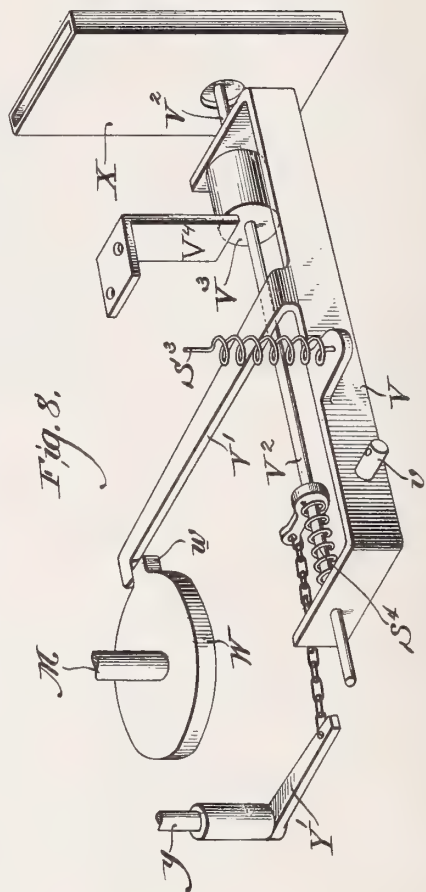
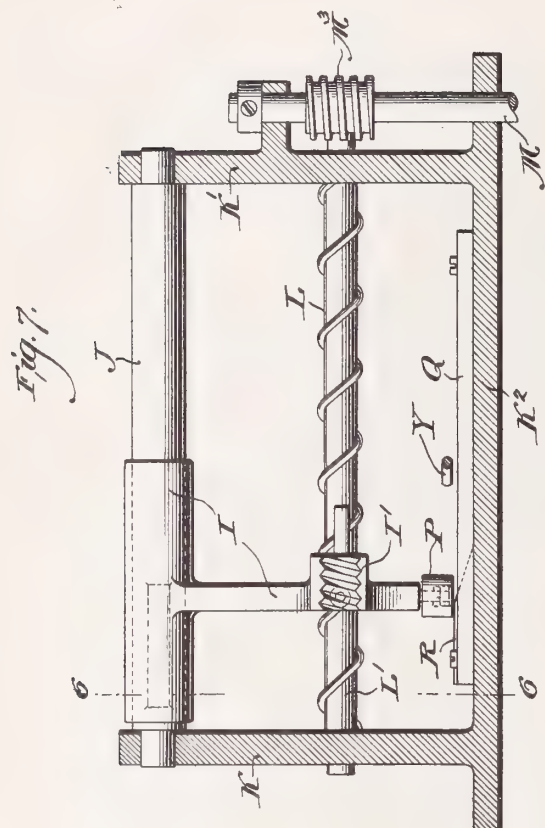
4 Sheets—Sheet 4.

J. W. JONES.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

No. 600,315.

Patented Mar. 8, 1898.



Witnesses.

Stewart
Robert W. Lloyds

Inventor.

Joseph W. Jones
by David Williams
Attorney.

UNITED STATES PATENT OFFICE.

JOSEPH W. JONES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JOSEPH A. VINCENT, OF SAME PLACE.

SOUND RECORDING AND REPRODUCING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 600,315, dated March 8, 1898.

Application filed March 13, 1897. Serial No. 627,276. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. JONES, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Instruments; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to new and useful improvements in sound recording and reproducing instruments, especially that class of instruments known as "gramophones," and has for its object to provide a simple automatic device having for its motive power a spring which is caused to operate by the insertion of a coin into the coin-chute of the machine, as shown in the drawings and more fully described hereinafter.

In the accompanying drawings, Figure 1 illustrates an end elevation, partly in section, of an instrument embodying the principle of my invention. Fig. 2 is a sectional view on the line 2 2 of Fig. 1, the top cover being removed and the standard supporting the instrument being omitted. Fig. 3 is a plan view of Fig. 2. Fig. 4 is a section on the line 4 4 of Fig. 2. Fig. 5 is a detached sectional view on the line 5 5 of Fig. 6. Fig. 6 is a detached sectional view on the line 6 6 of Fig. 7. Fig. 7 is a section on the line 7 7 of Fig. 6, and Fig. 8 is a detached perspective view of the mechanism controlled by a coin for starting and stopping the instrument.

Similar letters of reference refer to similar parts throughout the drawings.

A is the record, in the form of a disk having upon its face a layer of wax or other like material upon which sound-waves have been recorded.

B is a rotatable table carrying the record, the same being held in position by a thumb-screw B'. The shaft C, which supports said table, has suitable bearings in the framework

D of the motor, and motion is imparted to said shaft as follows:

A beveled pinion E on the shaft C engages a beveled gear E', loosely supported upon the shaft E². On the same shaft is loosely hung a pinion E³, connected by a sleeve to the beveled gear E', which meshes with a gear-wheel E⁴, fixed to a shaft E⁵, and upon this same shaft is fixed a pinion E⁶, which meshes with a gear-wheel E⁷, loosely hung to the shaft E².

The spring E⁸ is secured at one end to the shaft E², the outer end being connected to the gear-wheel E⁷ by a pin e⁷. Upon the shaft E² is also secured a ratchet-wheel E⁹, having a pawl e⁹ engaging it, which is pivoted to the framework of the motor. In winding the spring E⁸ the shaft E² is turned by a crank E¹⁰. (Shown in dotted lines in Fig. 1.)

The sound-box F of the instrument comprises a casing F' and ring F², between which is secured the diaphragm F³. The reduced portion f' of the casing is provided with a flexible tube F⁴, through which the sound-waves are conveyed to a coupling f⁴ in the cover and thence through the tube F⁵ to the earpieces.

The stylus or needle G is mounted in a binding-post G', provided with a set-screw G², the same being secured to a spring-plate G³, which is fastened to the sound-box by screws g g, the spring-plate G being connected to the diaphragm F³ by a pin f³ in the usual manner, and in some cases an additional spring-plate G⁴ may be employed, provided with an adjusting-screw g⁴.

Secured to and forming part of the sound-box is a short arm H, connected to the saddle I by means of screws h h, and in order to provide for a slight irregularity which I find will at times occur between the feed imparted to the saddle and that imparted to the stylus by the record I provide a slot h' in the arm H, in which one of the screws h is free to play.

The saddle I is sleeved at its upper end to a bar J, which bar is supported by uprights K and K', connected to and forming part of base-plate K². The saddle I is caused to travel backward and forward upon the bar J by means of two screws L and L'. The former, when engaged with the threaded portion of

the saddle I', will impart a slow movement corresponding to that imparted to the stylus or needle by the groove in the record-plate, the latter screw imparting a quick-return movement to the stylus after the same has been lifted from the face of the record.

The motive power for operating the screws L and L' is conveyed from the shaft C to the shaft M by means of pulleys C' and M', connected by a belt M². The shaft M is provided with a worm M³, which engages the teeth of the worm-wheels L² and L³, secured, respectively, to the ends of the worms L and L'.

The movements given to the saddle and sound-box carried thereby through the arm H are as follows: When the saddle is in the position shown in Figs. 3 and 5, the semi-threaded portion I' is in engagement with the worm L, which conveys the saddle forward until the same is brought in contact with the cam N, and a further movement compresses the spring *n* and brings the toothed portion of the cam into contact with a collar O, which is fixed to the worm-shaft, the same having corresponding teeth which engage the toothed portion of the cam. The cam now turns with the screw-shaft, and a pin *i*, projecting from the saddle, is acted upon by the cam and disengages the saddle from the screw L.

Suspended from the bottom of the saddle is a roller P, which when the saddle is in engagement with the screw L rests upon a track or guide Q. As the saddle is disengaged by the cam N from the screw L the roller, which has considerable vertical play upon the pin which secures it to the saddle, drops by gravity down behind the track or guide Q as the saddle is shifted and holds the saddle and pin I², projecting therefrom, into engagement with the quick-return worm L'.

In order that the pin I² will properly engage the thread of the screw L' when the saddle is shifted, I provide a spring S, which is located in an opening directly back of the pin, so that in case the pin strikes the thread at the moment the saddle is shifted the spring will be compressed until the pin is properly adjusted between the coils of the thread.

As the saddle is moved along by the worm L' the roller P is brought in contact with the inclined plane R, which raises said roller from the track or guide Q, and the weight of the sound-box shifts the saddle out of engagement with the worm L' and into engagement with the worm L.

The governor T is of the ordinary centrifugal type, comprising the weighted arms T' and T², connected to the sleeve T³ by connecting-links T⁴ and T⁵, a spring S² being interposed between the upper pivotal and fixed connection for the arms T' and T² and the loosely-supported flanged sleeve T³. The shaft T⁶, which carries the governor, is driven from the shaft C by means of a belt T⁷ and pulleys T⁸ and T⁹. The speed of the machine is regulated by a plate U and thumb-screw *u*², the former being pivoted at a point *u* and pro-

vided with a pad *u'*, which bears against the flanged portion of the sleeve T to a greater or less extent as the governor revolves, and governs the speed of the device by the frictional contact between said parts.

The coin mechanism for controlling the operation of the instrument embraces a lever V, which is pivoted at a point *v*, the weight of said lever and its connecting parts being counterbalanced by a spring S³. An arm V' projects out some distance from the lever V and normally engages a projection *w* on the disk W, which latter is secured to and rotated by the shaft M. Carried by the lever V is a bar V², acted upon in one direction by a spring S⁴, so as to cause one end of the bar to lie in the path taken by the coin in the chute X. When a coin is inserted into the chute X, it passes along until it comes in contact with the projecting end of the bar V², the weight of the coin being sufficient to bear down the lever V against the action of the spring S³, which disengages the arm V from the projection *w* on the disk W. The instrument being free to operate, the saddle I is fed slowly forward by the screw L, the roller P coming in contact at or near the end of its travel with a lever Y, which, being connected to the lever Y' by a small shaft *y*, operates the bar V² against the action of the spring S⁴ and releases the coin. The coin being released from the bar V², the spring S³ comes into action and returns the lever V to its normal position; but as the roller V³ at this point has been carried forward by the bar V² in releasing the coin the roller V³, upon the return of the lever V, comes in contact with a stop V⁴, which prevents the arm V' from engaging and locking the disk W until the saddle I has been reversed by the screw L and carried a distance sufficient to disengage the lever Y and allow the spring S⁴ to return the bar V² to its initial position.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a gramophone, a record-disk mounted upon a vertical shaft, a sound-box provided with a stylus operated upon by the record, spring means for rotating said record, a device connected with and adapted to guide the sound-box, said device being supported so as to be capable of traveling across the face of the disk, a screw connected with the source of power and adapted to engage with said device and automatically impart to it and the sound-box a slow positive motion in one direction across the disk, a second screw adapted to engage with said device and automatically impart to it a quick positive motion in the opposite direction and a cam for shifting said device from one to the other of said screws.

2. In a gramophone, a record-disk, spring means for rotating the same, a sound-box provided with a diaphragm and stylus operated upon by the record, a short arm connected to the sound-box and guided by a bar supported by the framework of the machine, a screw

connected to the source of power and adapted to convey the sound-box and its connections with a slow motion across the face of the disk in one direction, a second screw connected
 5 with the source of power and adapted to convey the sound-box and its connections with a quick motion in the opposite direction, and a cam mounted upon one of said screws for transferring the arm carrying the sound-box
 10 from one to the other of said screws.

3. In a gramophone, a record-disk mounted upon a table supported upon a vertical shaft, spring means for rotating said shaft, a sound-box provided with a diaphragm and stylus
 15 operated upon by the record, a short arm connected to the sound-box and fulcrumed to a suitable bearing upon a horizontal bar which is supported by the framework of the machine, a screw connected to the source of
 20 power and adapted to convey the sound-box and its connections with a slow motion across the face of the disk in one direction, a second screw connected to the source of power and adapted to move the sound-box and its con-
 25 nections with a quick motion in the opposite direction, and a cam carried by the first-mentioned screw for transferring the arm carrying the sound-box from one to the other of the screws.

30 4. In a gramophone, a record-disk suitably supported upon a vertical shaft, spring means for rotating said shaft, a sound-box provided with a diaphragm and stylus operated upon by the record, a short arm connected to the
 35 sound-box and having a bearing fulcrumed to a saddle upon a bar which is supported by the framework of the machine, a screw connected to the source of power and adapted to convey the saddle and its connections across
 40 the face of the disk in one direction, a second screw connected to the source of power and adapted to move the saddle and its connections in the opposite direction, a cam operated by the first-named screw for transferring the arm carrying the sound-box from one
 45 to the other of said screws, a coin-chute, a pivoted lever, one end of which is in line with said coin-chute and adapted to be acted upon by a coin so as to unlock the operating mechanism.

50 5. In a gramophone, a record-disk mounted upon a table supported upon a vertical shaft, spring means for rotating said shaft, a sound-box provided with a diaphragm and stylus
 55 operated upon by the record, a short arm con-

nected to the sound-box and having a suitable bearing upon a horizontal bar which is supported by the framework of the machine, a screw connected to the source of power and adapted to convey the sound-box and its con-
 60 nections with a slow motion across the face of the record-disk in one direction, a second screw connected to the source of power and adapted to move the sound-box and its connections with a quick motion in the opposite
 65 direction, means for transferring the arm carrying the sound-box from one to the other of the screws, a coin-chute, a pivoted lever one end of which is in line with said coin-chute and adapted to be acted upon by a coin so as
 70 to unlock the operating mechanism.

6. In a gramophone, a record-disk mounted upon a rotatable table, spring mechanism for operating the same, a sound-box provided with a diaphragm and stylus which is adapted
 75 to traverse across the face of the record, a screw for conveying the sound-box in one direction with a slow motion, a screw for conveying the sound-box in the opposite direction, and a cam mounted upon one of said
 80 screws, the same being adapted to shift the parts carrying the sound-box out of engagement with one and into engagement with the other of the said screws.

7. In a gramophone, a record-disk mounted
 85 upon and detachably secured to a rotatable table which is supported and carried by a vertical shaft, spring means as shown and described for operating said shaft, a sound-box provided with a diaphragm and stylus oper-
 90 ated upon by the record, an arm connected with and adapted to guide the sound-box, a saddle having a yielding connection with said arm and being sleeved to a horizontal rod suitably supported at its ends, a screw for
 95 operating said saddle with a slow motion in one direction, a cam as shown and described for disengaging said saddle at the end of its travel, a screw adapted to impart a quick motion to the saddle in the opposite direction,
 100 means as shown and described for keeping said saddle in contact with the last-mentioned screw and releasing the same therefrom at the end of its travel.

In testimony whereof I affix my signature 105
 in presence of two witnesses.

JOSEPH W. JONES.

Witnesses:

ROBERT W. LLOYD,
 D. STEWART.

(No Model.)

2 Sheets—Sheet 1.

E. R. JOHNSON.

GRAMOPHONE AND ACTUATING DEVICE THEREFOR.

No. 601,198.

Patented Mar. 22, 1898.

FIG. 1

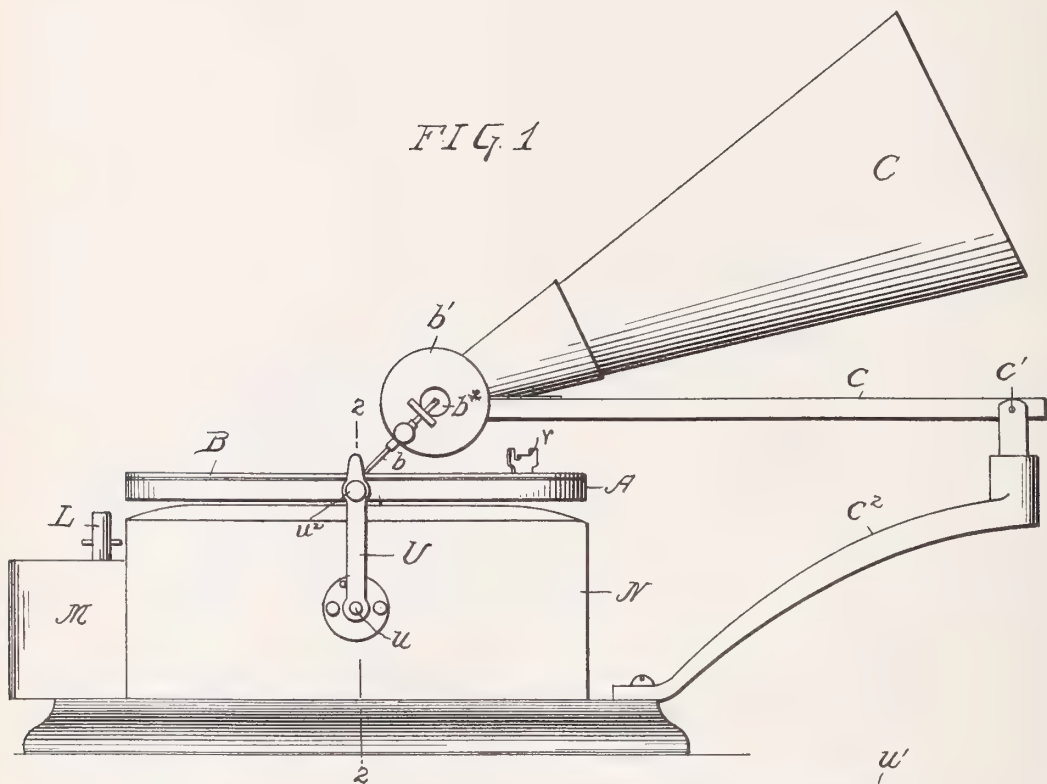


FIG. 2

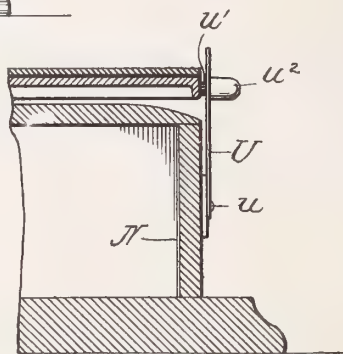
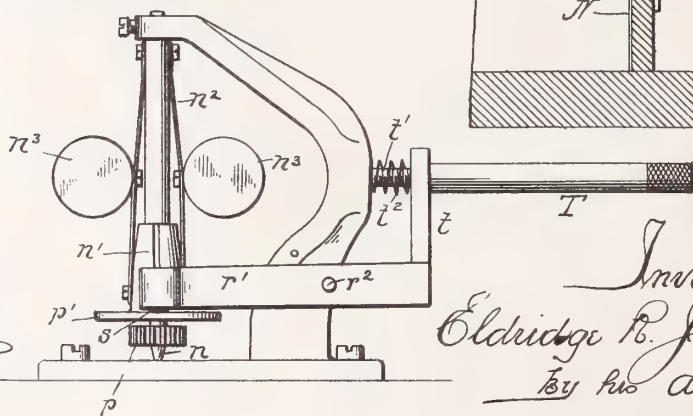


FIG. 5



Witnesses:
Jno. C. Carter
Burr. Peoples.

Inventor:
Eldridge R. Johnson.
By his Attorney,
1 time Patent.

(No Model.)

2 Sheets—Sheet 2.

E. R. JOHNSON.
GRAMOPHONE AND ACTUATING DEVICE THEREFOR.
No. 601,198. Patented Mar. 22, 1898.

FIG. 3

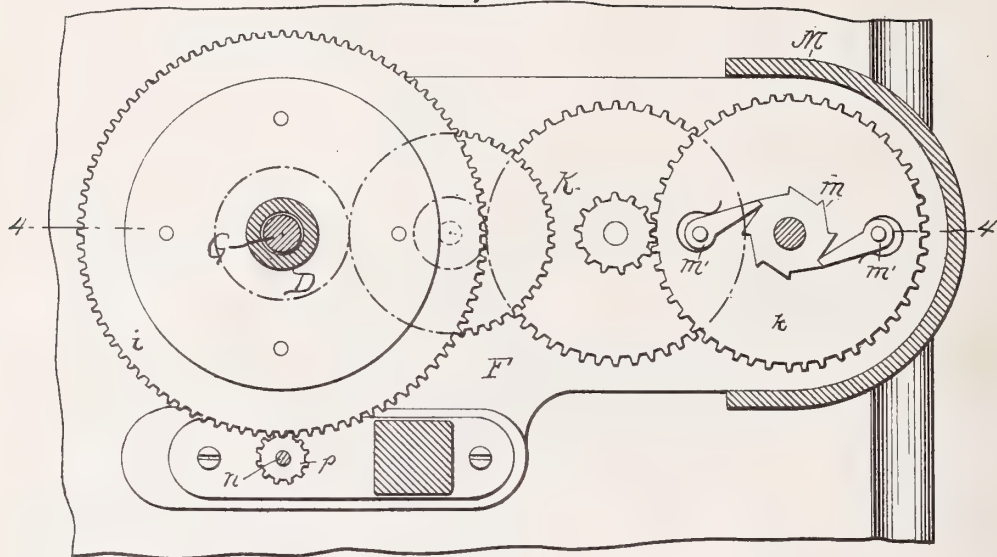
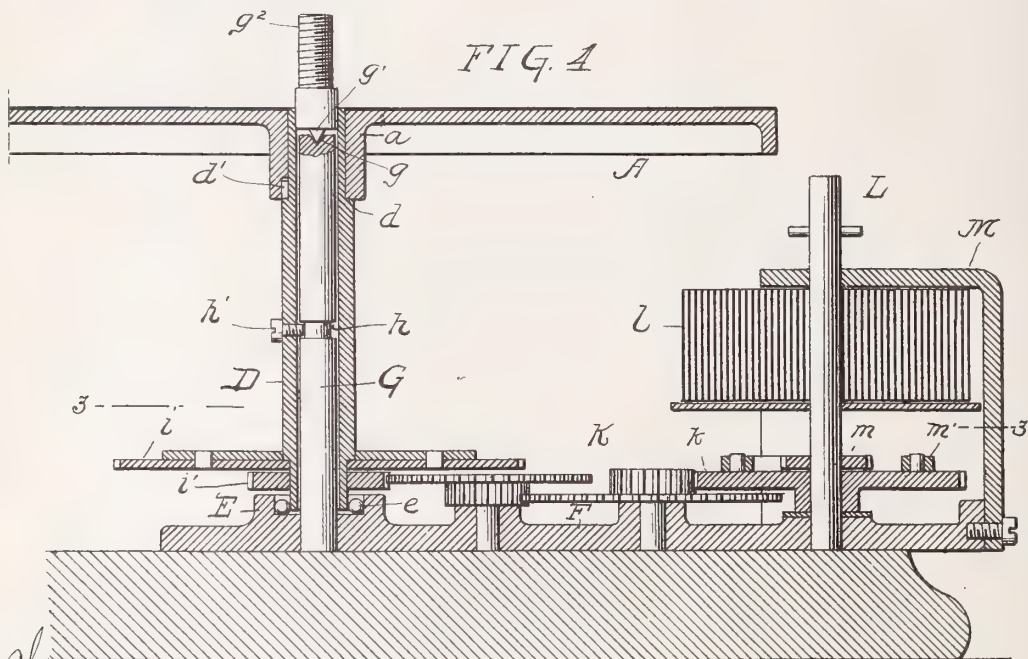


FIG. 4



Witnesses:
Jno E Parker
Burr Kieffer

Inventor:
Eldridge R. Johnson.
By his Attorney,
1 Stone Bldg

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF CAMDEN, NEW JERSEY.

GRAMOPHONE AND ACTUATING DEVICE THEREFOR.

SPECIFICATION forming part of Letters Patent No. 601,198, dated March 22, 1898.

Application filed August 19, 1897. Serial No. 648,751. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of Camden, State of New Jersey, have invented certain new and useful Improvements in Gramophones and Actuating Devices Therefor, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to certain improvements in gramophones and sound recording and reproducing machines of like nature in which a record disk or cylinder is propelled by power, and has for its principal object to provide an improved form of mechanism for effecting the rotation of the disk under the reproducing-stylus.

My invention further comprises certain improvements in the mechanism for supporting and rotating the record-disk and for adjusting and regulating the rotations of the latter, as more fully set forth hereinafter.

In the accompanying drawings, Figure 1 is an elevation of a gramophone arranged and constructed in accordance with my invention. Fig. 2 is a sectional elevation of a portion of the same on the line 2 2, Fig. 1. Fig. 3 is a sectional plan view of a portion of the driving mechanism on the line 3 3, Fig. 4. Fig. 4 is a sectional elevation of the same on the line 4 4, Fig. 3; and Fig. 5 is an elevation of the governor for regulating the speed of rotation of the table, on which the record-disk is supported.

Referring to the drawings, A represents a circular table or platform, on which is placed a record-disk B, in which has been formed a continuous record-groove by a needle or stylus and a diaphragm vibrated by sound-waves in the usual manner. The table and disk are rotated under a stylus *b*, secured to a casing *b'* and connected at one end to a suitable diaphragm *b²*, from which leads a trumpet or earpiece C. This mechanism is carried by an arm *c*, pivoted at *c'* to a support *c²* and so arranged that it may be free to travel during the rotation of the disk.

The table A has a central hub *a*, which rests upon a shoulder *d*, formed near the upper end of a sleeve D, and is keyed to said sleeve by a pin *d'*. The lower end of the sleeve is of

somewhat smaller diameter and preferably rests within a cup E, in which are placed a number of balls *e*, acting to keep the sleeve in a central position. It is clear, however, that the sleeve can be maintained in a central position by other means—such, for instance, as by the use of an ordinary metal bushing or collar adjusted around the lower end of the post and within the sleeve.

From the base F of the operating mechanism extends a vertical post G, having in its upper end a conical depression or recess *g* for the reception of a conical pin *g'*, secured or formed integral with a threaded post *g²*, keyed or otherwise secured to the sleeve D and arranged to rotate with the sleeve during the operation of the machine. The post G is provided about midway of its length with an annular groove *h*, into which extends a set-screw *h'*, carried by the sleeve D and adapted to prevent any excessive vertical movement of the sleeve.

To the sleeve D are secured a gear-wheel *i* and a pinion *i'*, which latter is driven by a train of gearing K from a gear-wheel *k*, carried by a winding-post L, to which latter is secured one end of a spiral spring *l*. The opposite end of the spring *l* is secured to a semicircular casing M, arranged at one side of the box or casing N, and the connection between the winding-post and the gear-wheel *k* is through a ratchet-wheel *m*, carried by the post, and pawls *m'*, carried by the gear-wheel and arranged to make contact with the teeth of the ratchet-wheel *m*.

The casing M serves to keep the spiral spring within a comparatively small space without materially interfering with the unwinding of its coils, and at the same time forms a bearing or support for the upper end of the winding-post L.

At one side of the train of gearing is arranged a governor, constructed in the manner shown in Fig. 5 and comprising a vertical shaft *n*, having upper and lower bearings and provided with a sleeve *n'*, to which are secured the lower ends of springs *n²*, carrying weights or balls *n³*. The shaft *n* is provided with a pinion *p*, arranged to intermesh with the gear-wheel *i*, and immediately above the pinion is a disk *p'*, secured to or formed integral with the sleeve *n'*, and so arranged

that as the speed of rotation increases the disk will be vertically raised and make contact with an arm or arms r' , pivoted at r^2 to the governor-standard, so that an excessive speed of rotation will be checked by the frictional contact between the upper face of the disk and rubber bearing-blocks s , carried by the arms r' . To the outer ends of the bars r' is secured an arm t , having an opening for the passage of a rod T , threaded at t' and screwing into a threaded opening in the governor-standard, so that by turning the rod T the arms r' may be moved to a greater or less distance from the disk p' and the rotations of the governor be checked at any desired point. To oppose the adjustment of the arms r' , a coiled spring t^2 is placed around the threaded end t' of the rod T at a point between the governor-standard and the arm t .

At one side of the box or casing N is secured an arm U , pivoted at its lower end to a plate u , and at its upper end being provided with a small block u' , of rubber or similar material, adapted to make contact with the periphery of the supporting-table A . The arm U has an operating handle or knob u^3 , by which it may be moved into contact with the edge of the disk when it is desired to check the speed of the latter.

At one side of the casing N is secured a rest or stop v for the reception and support of the diaphragm-case b' when the latter is moved on its supporting-lever c during the removal of a new record-disk or at times when the machine is out of operation.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination of the rotatable table, a driving-sleeve for said table, mechanism for rotating said sleeve, a stationary supporting-post within said sleeve and a step-supporting pin between the table and the top of said post.

2. The combination of the rotatable table, a driving-sleeve therefor, means for supporting said sleeve, a roller-bearing acting to maintain the sleeve in a central position, and means for rotating said sleeve.

3. The combination of the rotatable table, a driving-sleeve operatively connected thereto, a supporting-post, means for centrally supporting said sleeve on said post, and mechanism for rotating said sleeve, substantially as specified.

4. The combination of the supporting-post having a recessed upper end, a rotatable table, a driving-sleeve operatively connected thereto, a conical pin carried by the sleeve

and adapted to fit within the recessed end of the post, and a ball-bearing adapted to keep the lower end of the sleeve in a central position, substantially as specified.

5. The combination of the rotatable table, a driving-spring, gearing operatively connecting the spring and table, a winding-post carrying said spring, and a casing surrounding said spring and forming a bearing for said post.

6. The combination of the rotatable table, a driving-sleeve therefor, means for supporting said sleeve, a roller-bearing acting to maintain the sleeve in a central position, a driving-gear secured to said sleeve at or near the lower end thereof, and mechanism for rotating said driving-gear.

7. In a motor the combination of a driving-sleeve, a supporting-post extending partly within the sleeve and having a bearing-surface for contact therewith, means for maintaining the sleeve in a central position, a driving-gear secured to said sleeve at or near the lower end thereof, and means for rotating said driving-gear.

8. The combination of the rotatable table, a clockwork mechanism for rotating the same, a governing device for regulating the speed of such mechanism, a frame carrying said governing device, said frame being adjustable as a whole, toward and from the clockwork mechanism.

9. The combination of the rotatable table, a motor for driving the same, a governing device, an adjustable frame carrying the same, gears on the motor and on the governor, said governor-frame being adjustable toward and from the motor mechanism to regulate the degree of intermesh of gears, substantially as specified.

10. The combination of the rotatable table, a motor for driving the same, a frame adjustable as a whole toward and from the motor mechanism, and a governor having its central or main shaft supported at opposite ends in bearings in said frame.

11. The combination of the rotatable table, a motor for driving the same, a governor having centrifugally-operated arms, a friction-disk movable by said arms, and a regulating-lever having arms or fingers adapted to make contact with said disk, and means for adjusting said arms, substantially as specified.

In witness whereof I have hereunto set my hand this 18th day of August, A. D. 1897.

ELDRIDGE R. JOHNSON.

Witnesses:

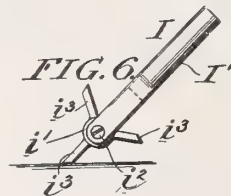
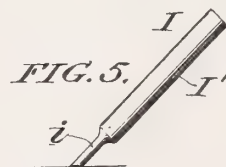
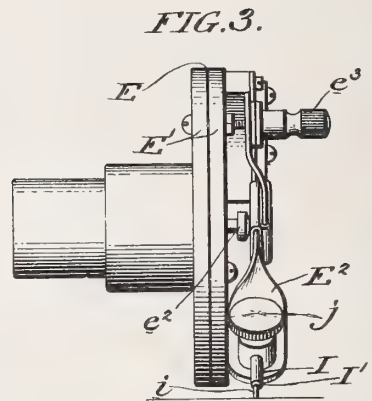
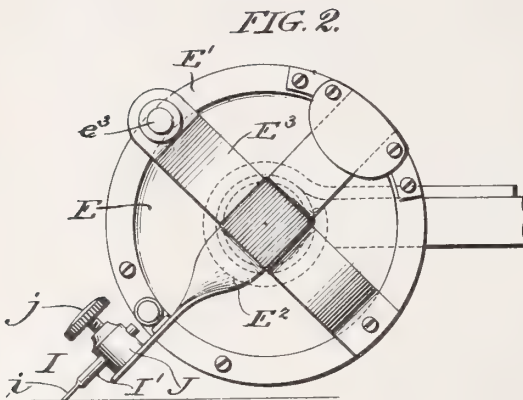
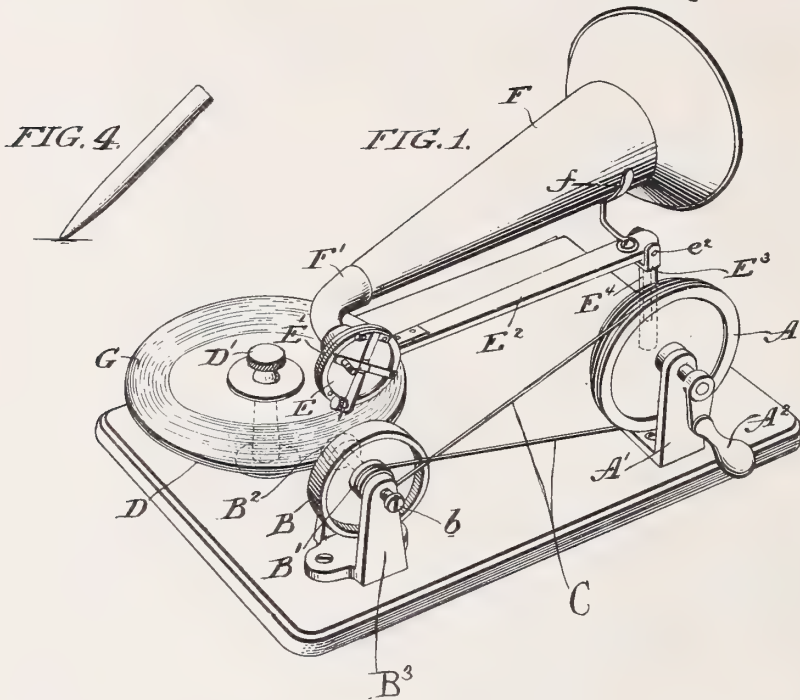
W. S. FURST,
JNO. E. PARKER.

(No Model.)

J. W. JONES.
GRAMOPHONE NEEDLE.

No. 602,453.

Patented Apr. 19, 1898.



WITNESSES:
Henry Dancy
Attest

INVENTOR
Joseph W. Jones
by his Attorney
David S. Williams

UNITED STATES PATENT OFFICE.

JOSEPH WILLIAM JONES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JOSEPH A. VINCENT, OF SAME PLACE.

GRAMOPHONE-NEEDLE.

SPECIFICATION forming part of Letters Patent No. 602,453, dated April 19, 1898.

Application filed February 9, 1897. Serial No. 622,698. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH WILLIAM JONES, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Gramophone-Needles; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in needles for gramophones, the object being to produce a needle having a point or end of reduced but uniform diameter, so that it will adjust itself as the point wears away by use to the spiral groove in the disk containing the record without changing the vibration or sound produced by the instrument.

In the accompanying drawings, Figure 1 illustrates a perspective view of a gramophone of the usual construction, showing the manner in which the stylus or needle is brought into action with the disk containing the record. Fig. 2 illustrates a detached side elevation, enlarged, of the diaphragm and casing, showing the manner of adjusting the stylus or needle to the spring-plate controlling the diaphragm. Fig. 3 is an end view of that portion of the machine shown in Fig. 2. Fig. 4 illustrates a side elevation of the stylus or needle commonly employed in gramophones. Fig. 5 represents a side elevation of a stylus or needle embodying my improvements, and Fig. 6 is a similar view showing a somewhat modified form of my invention.

Referring to the letters of reference in the accompanying drawings, A designates the driving-pulley, mounted upon a shaft, which is supported by a bracket A', the shaft and pulley being operated by a crank A².

B is a balance-wheel provided with a grooved hub B' for the reception of the elastic cord C, and B² is a friction-wheel which bears upon the under side of the disk D for the purpose of rotating the same. The balance-wheel B and friction-wheel B² are mounted upon a shaft supported by the bracket B³. The latter is provided with a set-screw b for adjusting the shaft.

The diaphragm E and its casing E' are

mounted upon a bar E², hinged at a point e² to a bracket E³, which is pivotally mounted in an upright E⁴, so that a universal movement is given to the said bar.

The horn F is supported at one end from the bracket E² by a rest f and at the opposite end by an elbow F', connected to the diaphragm-casing. Upon the support D is detachably secured, by means of a screw-cap D', a disk G, preferably formed of rubber, containing the record in the form of an irregular helical groove or channel, which is traversed by the stylus or needle I as the disk rotates.

The diaphragm E is acted upon by a spring-arm E² through the medium of a pin e², and a plate-spring E³ bears upon the said arm, the tension imparted thereto being regulated by a thumb-nut e³. The end of the arm E² is provided with a binding-post J, adapted to receive the stylus or needle I, which is firmly held in the binding-post J by a screw j.

I find in practice that after the needle has passed over the record several times the point is worn away, and where an ordinary needle is employed, such as I have illustrated in Fig. 4, the worn point presents a greater surface to the spiral groove in the record and the sound-vibrations become low and indistinct, so that in order to produce the proper volume and quality of sound the worn needle must be removed after several reproductions of the record and a new one substituted, which requires the operator to keep a supply of pointed needles constantly on hand.

In carrying out my invention I provide a needle I with a stout shank I', which is essential in preventing the absorption of the delicate vibrations in passing from the point of the needle to the diaphragm, and a point i, having a uniform diameter approximately the width of the spiral groove in the record. The extreme end, which is brought in contact with said groove, is beveled at the required angle, so that as the needle is worn away the same amount of surface traverses the record and the sound waves or vibrations are rendered clear and distinct and the same volume and quality of tone is preserved.

In the modified form of my invention, shown in Fig. 6 the same general principle is carried out; but in order to impart to

the needle-point a still greater working capacity I provide the shank I' with a hub i', which is fastened to the shank by a screw i². Upon said hub are arranged a number of points i³, so that as one of the points becomes worn a new point may be brought into action by turning the hub i' without removing the shank of the needle from the binding-post.

10 Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

15 1. A gramophone-needle having its working end reduced, said end being of the same diameter throughout its length, the same being adapted to the groove of the record.

2. A gramophone-needle having its working end reduced, said end being of the same diameter throughout its length and beveled

at the point, the same being adapted to the 20 groove of the record.

3. A gramophone - needle comprising a shank having one or more reduced ends of the same diameter throughout their length, the same being adapted to the groove of the 25 record.

4. A gramophone - needle comprising a shank, I', a hub, i', pivotally secured thereto, provided with a plurality of points, said points being of the same diameter throughout their length the same being adapted to 30 the groove of the record.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH WILLIAM JONES.

Witnesses:

J. A. VINCENT,

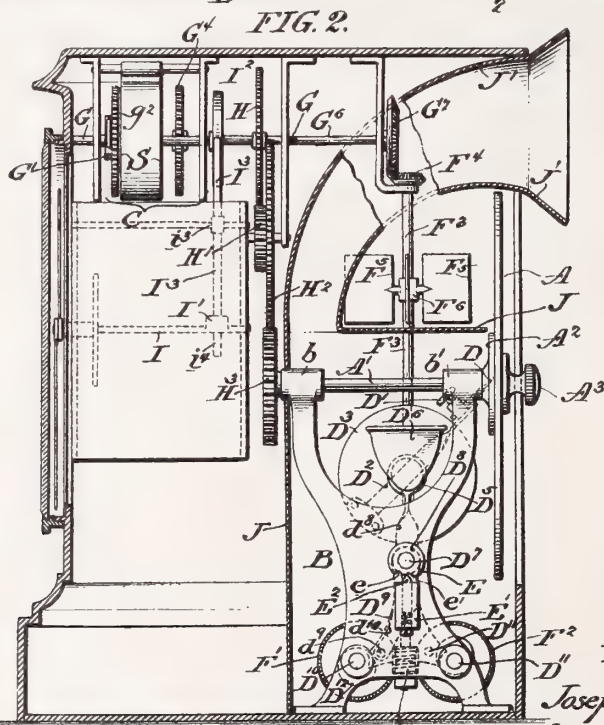
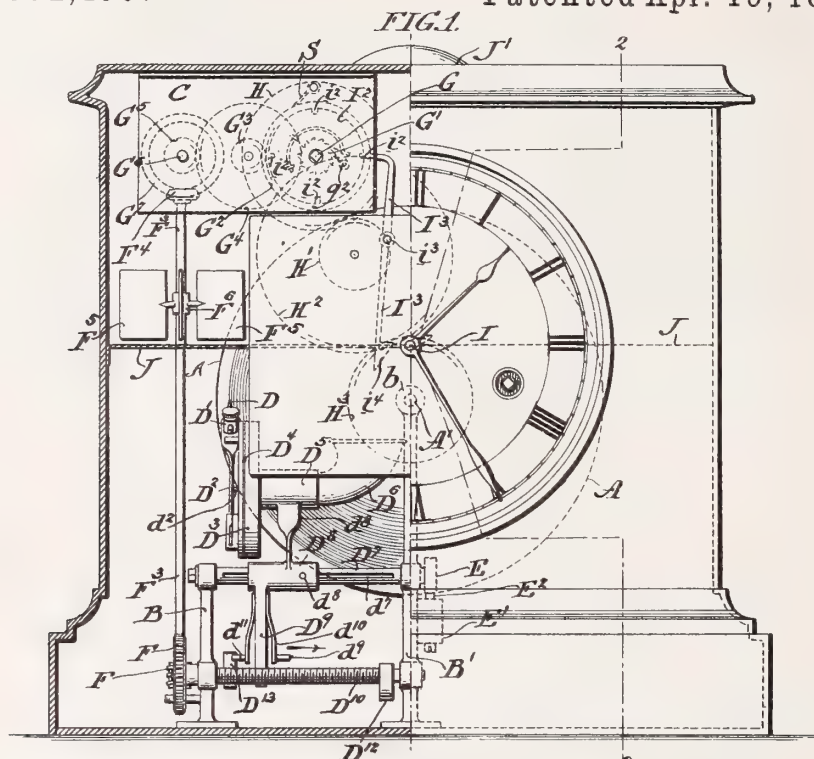
WILLIAM C. STOEVEY.

(No Model.)

J. A. VINCENT.
COMBINED CLOCK AND GRAMOPHONE.

No. 602,490.

Patented Apr. 19, 1898.



WITNESSES:

Henry Dancy

INVENTOR

Joseph A. Vincent
by his Attorney

Amid S. Williams & Co

UNITED STATES PATENT OFFICE.

JOSEPH A. VINCENT, OF PHILADELPHIA, PENNSYLVANIA.

COMBINED CLOCK AND GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 602,490, dated April 19, 1898.

Application filed February 11, 1897. Serial No. 622,895. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. VINCENT, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in a Combined Clock and Gramophone; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to novel improvements in clocks, the main object being to combine therewith a gramophone, graphophone, or phonograph which will work in unison with the clock mechanism and call out the hour or fraction thereof as the same is registered upon the dial.

My invention further consists in the novel construction and arrangement of the parts comprising the gramophone, which I prefer to use in this connection, and in the manner of controlling the same by the independent mechanism of the clock.

Referring to the accompanying drawings, Figure 1 illustrates a front elevation, partly in section, of a talking clock constructed in accordance with my invention; and Fig. 2 is a vertical section on the line 2 2 of Fig. 1.

Similar letters of reference refer to similar parts throughout the several views of the drawings.

A represents a disk formed of metal, hard rubber, or any suitable material and containing the record.

A' is a shaft working in bearings *b* and *b'*, formed upon the bracket B, and is provided with a small face-plate A², against which disk A is secured by means of a thumb-screw A³.

The disk A and shaft A' are rotated through the medium of a train of gearing operated by a spring-motor C, which is under the control of the clock mechanism, as more fully described hereinafter.

The stylus or needle D, which traverses the spiral groove formed upon the disk A, is held in a binding-post D', secured to a flat spring D², mounted upon the sound-box D³, which latter is provided with the usual diaphragm D¹, connected to the spring D² by a pin d².

A tube D⁵ projects from one side of the

sound-box and is provided with a short horn D⁶, the mouth of which is turned upward.

Upon the bar D⁷, which has bearings in the brackets B and B', is a sleeve D⁸, connected to the sound-box by a twisted spring d⁸, which allows a slight angular movement of the sound-box and parts connected thereto independent of the movement imparted to the sleeve.

The sleeve D⁸ has a depending lever D⁹, which is caused to travel backward and forward and impart a like movement to the sounding-box and stylus by means of screws D¹⁰ and D¹¹, the former screw being firmly threaded and adapted to slowly feed the stylus along the grooves of the record, while the latter screw is of steep pitch, causing a quick return of the lever D⁹ and parts connected therewith after the same has been carried forward to the full extent of its movement. The shifting of the lever D⁹ from one to the other of said screws, which causes the stylus to move into and out of engagement with the spiral grooves of the record, is accomplished in the following manner:

The bar D⁷, upon which the sleeve D⁸ is guided, is provided with a groove d⁷ for the reception of a pin or key d⁸, fitted to the sleeve D⁸. On the end of the bar D⁷ is a cam-plate E, provided with notches *e* and *e'*, and upon the bracket B is formed a lug E', provided with a vertical hole adapted to receive a spring-actuated plunger E², which is beveled at the end to properly enter one of notches *e* or *e'*. As the lever D⁹ is fed forward in the direction of the arrow the pin d⁹, fastened to a flat spring d¹⁰, which in turn is secured to said lever, moves in the path of the cam D¹², which forces the lever D⁹ out of engagement with the screw D¹⁰ and into engagement with the screw D¹¹. The plunger E² in the meantime being depressed enters the notch E' as the lever is shifted. At this point the stylus is disengaged from the spiral groove in the record. The screw D¹¹ carries the arm D⁹ in the reverse direction until the pin d¹¹ enters the path of the cam D¹³, when the arm D⁹ is again shifted and the stylus brought in contact with the spiral grooves of the record.

The screws D¹⁰ and D¹¹ are driven by a worm F, mounted on a shaft F³, which meshes with

the teeth of the worm-wheels F' and F^2 , secured to the ends of the screw-shafts D^{10} and D^{11} , respectively.

Motion is imparted to the vertical shaft F^3 by the spring-motor C, which comprises a shaft G, upon which is secured a ratchet-wheel G' . A spur-wheel G^2 is loosely hung upon said shaft and carries a pawl g^2 , which works in said ratchet.

The shaft is caused to rotate by means of a spiral spring S, which, through the medium of the ratchet-wheel G' , imparts motion to the spur-wheel G^2 . A pinion G^3 engages the latter, and upon the same shaft is secured a spur-wheel G^4 , which meshes with a pinion G^5 upon the shaft G^6 , the latter being provided at one end with a bevel-gear G^7 , which engages the bevel-pinion F^4 upon the shaft F^3 . The shaft G is also provided with a gear-wheel H, which engages a pinion H' , and upon the same shaft as that which supports the pinion H' is fastened a gear-wheel H^2 , which meshes with a pinion H^3 , mounted on the shaft A' .

It will be seen from the above description that motion is given to the disk containing the record, as well as to the sound-box and stylus, by the spring-motor C, through the medium of a train of gears. In order to control to some extent the speed of the spring-motor, I desire to provide a simple form of governor. The one which I have illustrated in Figs. 1 and 2 consists of a series of blades F^5 , mounted upon a central hub F^6 , which is in the present instance secured to the vertical shaft F^3 , although it will be readily understood that a governor of this type may be secured to any rapidly-moving portion of the motor.

The starting and stopping of the motor C is preferably controlled by the shaft upon which the minute-hand of the clock is mounted, and as the clock mechanism is of the ordinary type it has not been thought necessary to illustrate any of the details of construction. The shaft I, upon which the minute-hand of the clock is mounted, is provided with a dog I' , and upon the shaft G of the motor is a plate I^2 , provided with a number of radial slots i^2 . A lever I^3 is pivoted at a point i^3 . One end of said lever is adapted to rest in one of the slots in the plate I, while the other is provided with an inclined cam-surface i^4 , which is directly in the path of the dog I' . As the shaft I revolves the dog strikes the inclined portion of the lever I^3 and releases the upper end thereof from the slot in the plate I^2 . The motor is then free to rotate and operates the gramophone until the lever I^3 engages the next slot in the plate I^2 , when the spring-motor is locked until the dog on the shaft controlling the minute-hand completes a revolution and is again brought into action.

I prefer to inclose the gramophone in a casing J, extending the full width of the clock, and I provide at the top of said casing a horn J' , through which the sounds produced by the gramophone are conveyed and intensified.

I do not confine myself to this particular ar-

range ment of the parts, as it will be readily seen that the disk may be arranged in a horizontal as well as a vertical position and may be located in any convenient part of the clock-casing without departing from the spirit of my invention. The records, aside from calling out the hour, can be arranged to reproduce anything desired in music, words or songs, and, if desired, can be used for the purpose of reproducing anything in the line of advertising matter.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A combined clock and gramophone comprising a record-disk mounted upon a rotatable plate, spring mechanism for operating the same, a sound-box provided with a diaphragm and stylus which is adapted to traverse the face of the record, a screw operated by said spring mechanism for conveying the sound-box and stylus across the record-disk in one direction, a second screw for conveying the sound-box and stylus in the opposite direction, cams, one on each of said screws for shifting the parts carrying the sound-box and stylus out of engagement with one and into engagement with the other of said screws, the clock mechanism, a dog mounted upon a shaft of the clock mechanism, a lever controlled thereby, and a notched wheel operated upon by said lever and dog to unlock the spring mechanism of the gramophone.

2. A combined clock and gramophone comprising the clock mechanism, spring means for operating the same, a lever controlled by said clock mechanism, a record-disk mounted upon a rotatable plate, spring means for operating the same, a sound-box provided with a diaphragm and stylus which is adapted to traverse the face of the record, a screw for conveying the sound-box and stylus across the record-disk in one direction, a second screw for conveying the sound-box and stylus in the opposite direction, cams one on each of said screws for shifting the parts carrying the sound-box and stylus from one to the other of said screws and a notched plate secured to the main shaft of the spring mechanism of the gramophone and operated upon by the above-mentioned lever for locking said spring mechanism.

3. A combined clock and gramophone comprising a record detachably secured to a rotatable plate mounted upon a horizontal shaft, a sound-box and stylus acted upon by said record, a lever depending from said sound-box, a screw for acting upon said lever to move the sound-box and stylus in one direction, a screw acting upon said lever to move it and its connecting parts in the opposite direction, pins upon said lever, a cam upon each of said screws for acting upon said pins to shift the lever from one to the other of said screws, a spring-motor connected to said screws through a train of gearing for operating the same, and in like manner to the shaft

carrying the record, a disk carried by the main driving-shaft of said motor provided with a series of notches, a pivoted lever having one end adapted to the notches of said plate, the clock mechanism, a dog mounted upon the minute-hand shaft of the clock mechanism and adapted to act upon said lever, substantially as specified.

4. A gramophone comprising a disk containing the record secured to a plate mounted upon a rotatable shaft, a sound-box and a stylus controlled thereby, a traveling support for the sound-box and stylus flexibly connected to a sleeve guided upon a horizontal bar, said sleeve having an arm depending therefrom, a screw adapted to feed the traveling support in one direction, a cam mounted upon the screw and adapted to a pin upon the

depending arm for disengaging said arm from said screw, a screw adapted to feed the traveling support in the opposite direction, a cam upon said screw for acting upon a pin on said arm to disengage the same from the last-mentioned screw and move said arm into engagement with the opposite screw, and means controlling the bar upon which traveling support is sleeved for holding the depending arm into engagement with one or the other of the screws with a yielding tension.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH A. VINCENT.

Witnesses:

ROBERT W. LLOYD,
HENRY DRUR.

(No Model.)

3 Sheets—Sheet 1.

J. W. JONES.
SOUND REPRODUCING MACHINE.

No. 604,829.

Patented May 31, 1898.

FIG. 1.

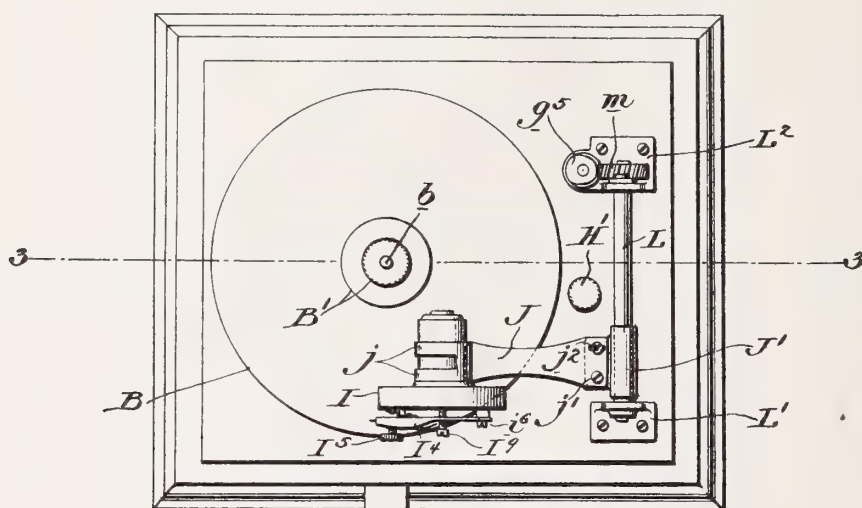
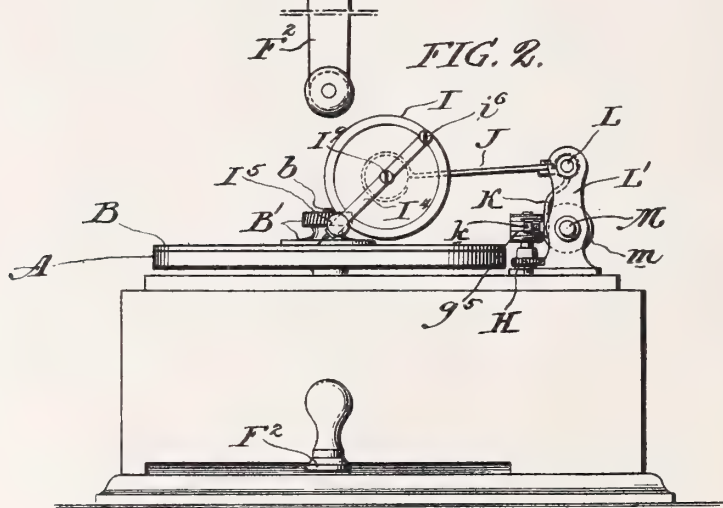


FIG. 2.



WITNESSES:

John T. Nolas
A. V. Group

INVENTOR

Joseph H. Jones
by
David Williams
Attorney

(No Model.)

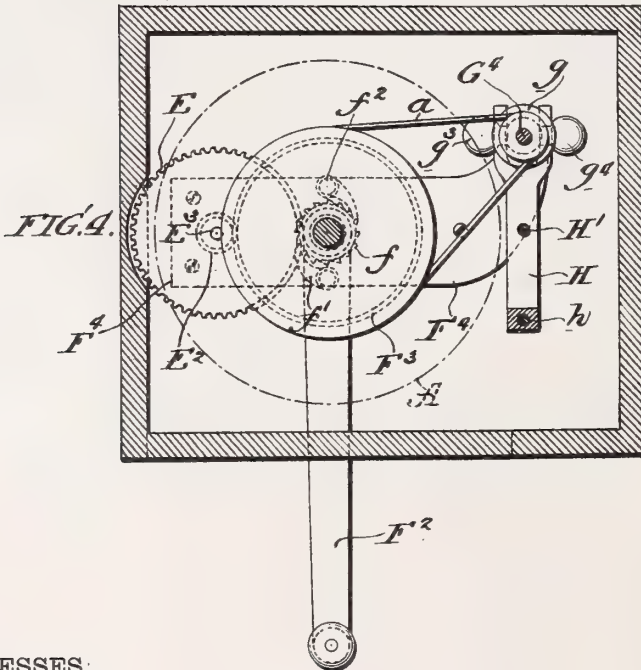
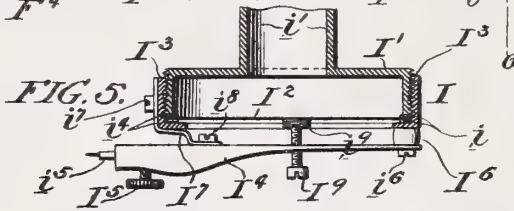
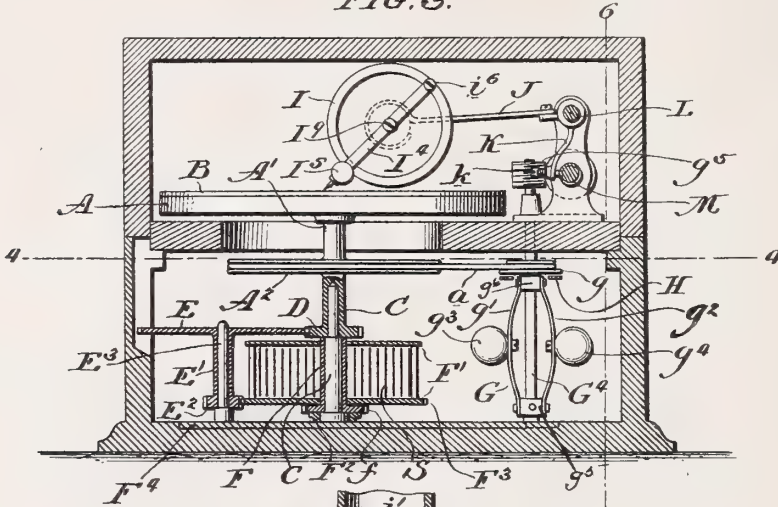
3 Sheets—Sheet 2.

J. W. JONES.
SOUND REPRODUCING MACHINE.

No. 604,829.

Patented May 31, 1898.

FIG. 3.



WITNESSES:

John K. Talbot
A. V. Groupe

INVENTOR

Joseph W. Jones
David S. Williams & Co.
Attorneys

(No Model.)

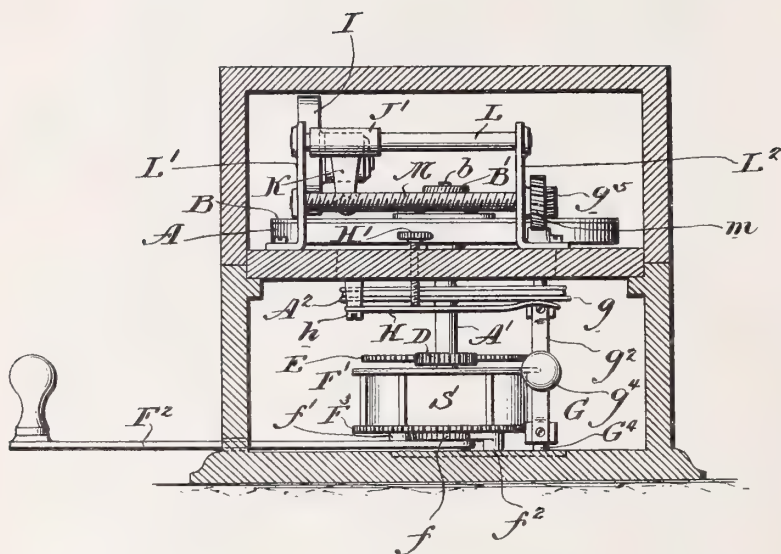
3 Sheets—Sheet 3.

J. W. JONES.
SOUND REPRODUCING MACHINE.

No. 604,829.

Patented May 31, 1898.

FIG. 6.



WITNESSES:

John R. Nelson
A.V. group

INVENTOR

Joseph H. Jones
By
David Sullivan
Attorney

UNITED STATES PATENT OFFICE.

JOSEPH W. JONES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
HIMSELF AND JOSEPH A. VINCENT, OF SAME PLACE.

SOUND-REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 604,829, dated May 31, 1898.

Application filed July 23, 1897. Serial No. 645,750. No model.

To all whom it may concern:

Be it known that I, JOSEPH W. JONES, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Sound-Reproducing Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in the reproducing apparatus adapted for use in the method of recording and reproducing sounds as carried out in that class of instruments known as "gramophones."

In this class of apparatus the record is produced on the face of a disk as a volute band consisting of a sinuous or undulating groove of even depth. In the production of the record a recording-stylus is caused to travel in a straight radial path from the circumference toward the center. The reproduction of the recorded sounds is effected by giving to a reproducing-stylus a vibratory movement by and in accordance with the sinuosities of the record-groove, and these vibratory movements being transmitted to a diaphragm vibrations of the latter give rise to sounds which are reproductions of the sounds originally produced in the recording apparatus.

In all reproducing apparatus of the above type, as far as I am aware, a long arm has been employed to support the sound-box and stylus, and where it has been desired to intensify the sound a horn in like manner has thereby been supported and carried, the movement imparted to the arm sound-box and horn being effected by the delicate groove of the record working in conjunction with the stylus. It frequently happens that the sinuosities of the record leave very delicate partition-lines between the volutes of said record, so that after several reproductions the grooves are caused to run together by the friction of the stylus, thus preventing a complete and perfect reproduction of the sound-waves recorded upon the record.

One of the main features of my invention,

therefore, has reference to the means for positively conveying the sound-box and stylus along with the parts connected thereto across the face of the record-disk at a uniform speed with the travel of the stylus.

Another feature of my invention is the construction of the sound-box and means for regulating the quality of sound thereby produced.

My invention further embodies the construction and arrangement of various parts of the apparatus, all of which will be more fully explained hereinafter.

In reference to the drawings accompanying this specification, Figure 1 represents a plan view of a device embodying my invention. Fig. 2 illustrates a front elevation of the same. Fig. 3 shows a sectional elevation on the line 3 3 of Fig. 1. Fig. 4 represents a sectional plan view on the line 4 4 of Fig. 3. Fig. 5 illustrates an enlarged sectional view of the sound-box diaphragm and stylus, and Fig. 6 illustrates a section on the line 6 6 of Fig. 3.

A represents a rotating table which I prefer to make of sufficient weight to act as a balance-wheel, so that in conjunction with the governor the table will have a tendency to more regularly rotate.

Upon the table A is placed the disk B, containing the record, the same having an opening in the center adapted to a threaded stem *b*, which projects from the top of the table A, the record-disk being held in place by a thumb-screw *B'*, which engages the threaded stem *b*. The table A is secured to a vertical shaft *A'*, which carries a pulley *A²*, which through the medium of the belt *a* and pulley *g* imparts a rotary motion to the governor G.

The lower end of the shaft *A'* is hollowed out to receive a stationary vertical shaft *C*, by which the shaft and table are supported, and upon the lower end of the shaft *A'* is a pinion *D*, which meshes with a spur-wheel *E*, secured to a sleeve *E'*, to which in like manner is fastened at the lower end thereof a pinion *E²*, all of which are supported upon the stationary vertical shaft *E³*.

Surrounding the stationary vertical shaft *C* is a sleeve *F*, which supports the spring-drum *F'* and to which the inner end of the spring *S* is secured.

The sleeve *F* is provided at the lower end

with ratchet-wheel *f*, operated by a pawl *f'*, which is pivoted to the winding-lever *F*². The lower side of the spring-drum *F'* is provided with a spur-wheel *F*³, forming a part of the spring-drum, and said spur-wheel meshing with the pinion *E*² imparts motion thereto from the spring *S*, the outer end of which is secured to said drum.

To the base-plate *F*⁴ is pivotally secured a retaining-pawl *f*², which engages with the ratchet-wheel *f* to lock the latter in position during the winding of the spring.

The mechanism for causing the sound-box and stylus to travel across the face of the record is driven from the governor-shaft, in order to impart a positive and more regular motion to the stylus.

The vertical shaft *G*⁴, which is driven by the pulley *g*, has a lower bearing in the plate *F*⁴ and an upper bearing in one of the brackets supporting the bar carrying the sound-box.

The governor itself, which is of very ordinary type, comprises two steel springs *g'* and *g*², to which are secured the weights *g*³ and *g*⁴. At the lower end of the governor said springs are secured to a block *g*⁵, which in turn is fixed to the shaft. The opposite ends of the springs are secured to a movable block *g*⁶, to which is secured the pulley *g*.

On the under side of the upper portion of the cover of the machine is a leaf-spring *H*, having forked ends capable of being adjusted with respect to the pulley *g*. The leaf-spring is pivoted at a point *h*, and at or near the center is an adjusting-screw by which the pressure of the spring upon the pulley *g* and consequent speed of the machine can be regulated.

The sound-box *I* is carried by a short arm *J*, having a spring portion *j*, which encircles the reduced end of the sound-box and holds the same firmly in position.

The arm *J* is connected to a sleeve *J'* by means of screws *j'* and *j*², the former acting as a fulcrum-point, while the latter is adapted to a slot in said arm, the object of this arrangement being to allow for any irregularity which may exist between the feed imparted to the stylus by the groove of the record and that given to the arm *J* by the mechanism acting upon the same.

The sleeve *J'* is mounted upon a horizontal bar *L*, which is supported at opposite ends by brackets *L'* and *L*², and in like manner said brackets form supports for the screw *M*.

Depending from the sleeve *J'* is an arm *K*, provided with a screw *k*, tapered at the end to engage the thread of the screw *M*, by which the sound-box is fed in one direction across the face of the record-disk, motion being imparted to said screw from the shaft *G*⁴ by the worm *g*⁵, mounted thereon, and worm-wheel *m*, secured to the end of the screw-shaft.

One of the features of my present invention is the sound-box *I*, which has been designed to overcome harsh and grating sounds emitted by reproducing-diaphragms and to further re-

duce the loudness of the sound, which cannot be received with comfort by the listener.

In the present construction the sound-box *I* comprises a casing or body portion *I'*, provided with a reduced portion *i'*, through which the sound-waves are conducted.

The diaphragm *I*² is secured to the body portion by a ring *I*³, and on opposite sides of the diaphragm between the ring and casing are soft-rubber washers *i*⁴.

The stylus-lever *I*⁴ has a heavy rigid portion to which the stylus *i*⁵ is secured by a thumb-screw *I*⁵, and a spring portion which is secured to the ring of the sound-box by a screw *i*⁶, there being a buffer *I*⁶ interposed between the stylus-lever and ring of the sound-box.

A delicate steel spring *I*⁷ serves to fulcrum the heavy end of the stylus-lever to the ring of the sound-box, the same being secured to the respective parts by screws *i*⁷ and *i*⁸.

The volume and quality of tone emitted from the sound-box is regulated by the set-screw *I*⁹, which is threaded to the stylus-lever at the center and bears against a buffer *i*⁹, fastened to the diaphragm, preferably formed of rubber.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound-reproducing machine a record-disk, suitably supported and rotated, a sound-box provided with a diaphragm and stylus, the latter being adapted to the record, a lever secured to the sound-box and hinged to a sleeved portion or carrier which is guided upon a horizontal bar, said lever being hinged in such a manner as to allow a slight movement of the sound-box and stylus independent of the motion imparted by the feed mechanism, the sleeved portion or carrier having a depending portion adapted to a feed-screw, the horizontal bar for guiding said carrier, the feed-screw arranged below the horizontal bar, a worm-wheel on said screw, and a worm driven from the source of power to impart motion to the worm-wheel.

2. A feed-motion for a sound-reproducing machine comprising a horizontal bar, a carrier mounted thereon having a depending portion engaging a feed-screw, the feed-screw, means as shown for imparting motion thereto, a sound-box provided with a diaphragm and stylus, the latter being adapted to a sound-record, and an arm secured to the sound-box and hinged to the carriage in such a manner as to allow a slight movement of the sound-box and stylus independent of the movement imparted thereto by the feed-screw.

3. A sound-reproducing machine consisting of a record-disk suitably supported and rotated, a sound-box provided with a diaphragm, a stylus-lever extending across the face of the diaphragm, having a rigid portion fulcrumed by a spring to the sound-box and a flexible portion secured by a screw to the sound-box, an adjusting-screw located at or

near the center of the stylus-lever, one end of which is in contact with the diaphragm, a sound-box lever hinged and guided upon a horizontal bar, said lever having a depending portion provided with a screw-thread, a screw for engaging the threaded depending portion of said lever, a worm-wheel upon the end of said screw, and a worm driven from the source of power for operating said worm-wheel.

4. A sound-box for a sound-reproducing machine, consisting of a diaphragm mounted in a box or casing, a stylus-lever having a rigid portion hinged to the box or casing by a thin leaf-spring, and a flexible portion united through the medium of a rubber cushion to the box or casing, and an adjustable set-screw threaded to the stylus-lever at or near the center thereof, adapted to engage a buffer secured to the center of the diaphragm.

5. In a sound-reproducing machine, a sound-box comprising a shell or casing provided with a diaphragm and stylus-lever, the latter passing diametrically across the face of the diaphragm, and having a rigid portion connected to the sound-box by a spring, and a flexible portion pivoted at the opposite side and provided with a buffer, and an adjusting-screw adapted to the center of the stylus-lever and bearing against the diaphragm, substantially as specified.

6. In a sound-reproducing machine a sound-box provided with a diaphragm and securing-ring, a stylus-lever extending across the face of the diaphragm having a rigid portion fulcrumed by a spring to the securing-ring and a flexible portion formed integral therewith and secured to said ring by a screw and an adjusting-screw passing through the stylus-lever and acting upon a buffer fixed to the center of the diaphragm, substantially as specified.

7. In a sound-reproducing machine, a sound-

box provided with a diaphragm, a stylus-lever extending diametrically across the face of the diaphragm and having a rigid portion fulcrumed at one side of the sound-box and a flexible portion secured to the opposite side of the sound-box with an adjustable screw threaded to the stylus-lever at or near the center and adapted to press upon the diaphragm, substantially as specified.

8. In a sound-reproducing machine, a sound-box provided with a diaphragm and securing-ring, a stylus-lever, extending across the face of the diaphragm, having a thickened and rigid portion fulcrumed by a spring to the securing-ring and a flexible portion united by a yielding pivotal connection to the opposite side of the securing-ring with an adjustable screw passing through the stylus-lever and acting upon the diaphragm, substantially as specified.

9. In a sound-reproducing machine, a sound-box provided with a diaphragm and securing-ring, a stylus-lever extending diametrically across the face of the diaphragm, the same being thick and rigid at one end and thin and flexible at the other, a leaf-spring interposed between the rigid portion of the stylus-lever and the securing-ring, an elastic buffer interposed between the flexible end of the stylus-lever and the securing-ring with a screw for holding the same in position, and an adjusting-screw passing through the center of the stylus-lever and acting upon the diaphragm through the medium of an elastic buffer, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH W. JONES.

Witnesses:

GEO. W. REED,
DAVID S. WILLIAMS.

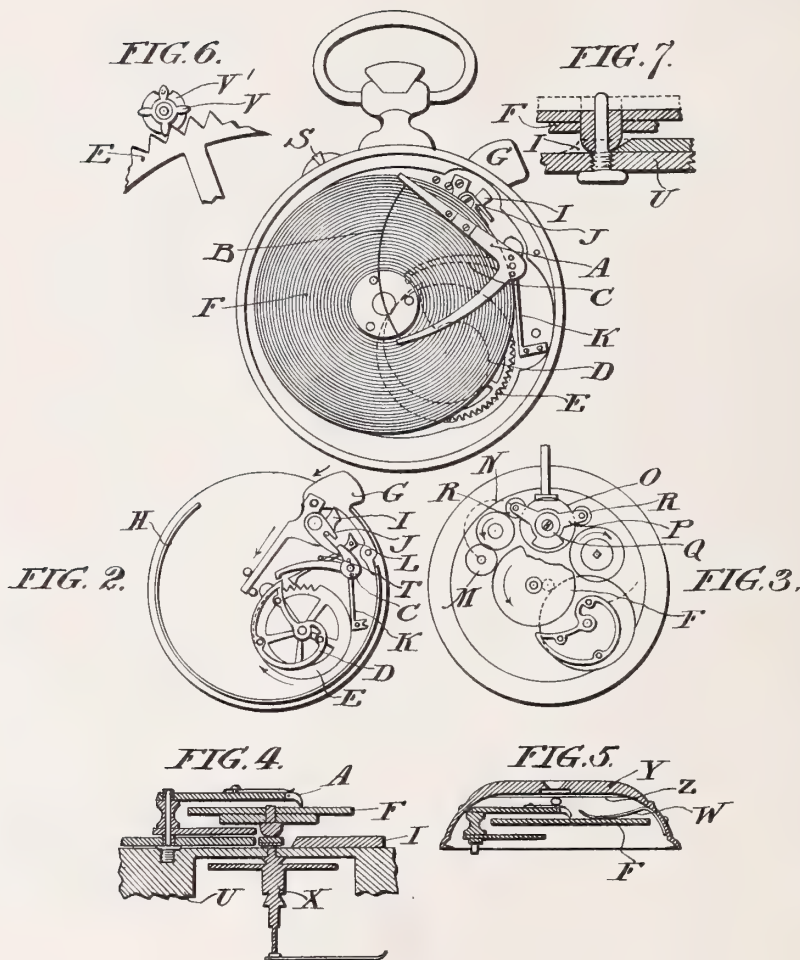
(No Model.)

C. SIVAN.
TALKING WATCH OR CLOCK.

No. 605,192.

Patented June 7, 1898.

FIG. 1.



WITNESSES:

J. Norman Dixon
Joshua Lancaster

INVENTOR

Casimir Sivan
by
David Williamson
Attorney

UNITED STATES PATENT OFFICE.

CASIMIR SIVAN, OF GENEVA, SWITZERLAND, ASSIGNOR TO JOSEPH A. VINCENT, OF PHILADELPHIA, PENNSYLVANIA.

TALKING WATCH OR CLOCK.

SPECIFICATION forming part of Letters Patent No. 605,192, dated June 7, 1898.

Application filed August 24, 1897. Serial No. 649,288. (No model.) Patented in Switzerland February 21, 1892, No. 4,918.

To all whom it may concern:

Be it known that I, CASIMIR SIVAN, a citizen of the Republic of Switzerland, residing at Geneva, in the canton of Geneva, Switzerland, have invented certain new and useful Improvements in Talking Watches or Clocks; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention consists of a novel construction and arrangement of mechanism for clocks and watches, as set out in the Swiss patent granted to me February 21, 1892, and being serially numbered 4,918, and embodies a disk provided with a number of concentric rings, each of which has upon its surface waves or undulations made in accordance with sound-vibrations for the purpose of calling out the hour or fraction thereof in place of the ordinary striking mechanism.

My invention further consists in mechanism for controlling said disk and in operating the same in unison with the ordinary clock or watch mechanism, as will be fully set out hereinafter.

Referring to the accompanying drawings, Figure 1 illustrates a rear elevation of a watch embodying my improvements, the rear case being removed for the purpose of exposing the record-disk and mechanism connected therewith. Fig. 2 illustrates a similar view with the outer case and record-disk removed, showing only the mechanism for elevating the record-disk and adjusting or regulating the position of the stylus with respect to the rings on the record-disk. Fig. 3 illustrates in diagram the mechanism for winding the two spring-drums, one for operating the clock mechanism and the other for operating the mechanism designed to rotate the record-disk. Fig. 4 represents a detached sectional view, enlarged, of the casing, carrying the stylus and record-disk, the minute-hand and pinion-hand connected to its shaft for operating the stylus through the medium of a gear-wheel. Fig. 5 is a sectional view of one of the cases

or covers of the watch, showing the diaphragm-stylus and record-disk with relation to said cover or casing. Fig. 6 is a detached view, enlarged, showing a portion of the gear-wheel carrying the stepped cam for determining the position of the stylus and the pinion for operating the same; and Fig. 7 is a sectional view, enlarged, showing a portion of the record-disk, its pivot, and a portion of the pointed or wedge-shaped arm for raising the record-disk into engagement with the stylus.

Referring to the letters of reference marked upon the drawings, A represents a stylus-lever provided with the usual stylus-points adapted to the record *a*, with a stout wire B, bent in the arc of a circle and extending from one to the other of the arms of the stylus-lever, as shown in Fig. 1 of the drawings, its function being to transmit the vibrations produced by the record to the diaphragm in the watchcase regardless of the position of the stylus.

On the shaft carrying the stylus is fixed a lever C, which rests upon and is controlled by the cam D, which determines the position of the stylus with respect to the rings upon the record-disk. This cam D is secured to a spur-wheel E, which engages a pinion V, secured to the shaft which carries the minute-hand of the watch, the minute-hand shaft being operated in the ordinary manner by a suitable train of gearing driven by means of a spring.

The record-disk F and its support, forming part thereof, are mounted upon a central shaft driven by a spring through the medium of a suitable train of gearing. The record-disk is formed of hard rubber or vulcanite and contains a number of concentric rings, each provided with an undulatory surface representing sound-waves which, through the medium of the diaphragm and stylus, call out the hour or fraction thereof corresponding to the time indicated by the hands on the dial of the watch.

The record-disk F is normally out of engagement with the stylus, and the lever C is by preference normally disengaged from the cam D. In bringing these parts into action I provide a pivoted lever G, which has a short

arm acted upon by a curved spring H, located in the edge of the watchcasing. The lever G is pivoted to a lever I, which has a long arm guided between the pins and tapered at its end, so that by depressing the lever G against the action of the spring H the tapered end of the lever I, passed under the conical end of the support carrying the record-disk, elevates it and brings the record-disk into engagement with the stylus. A lever J is secured to the framework of the watch by a pin which passes through a slot in the upper portion of the lever I. One end of the lever J is forked, and between the two prongs is a pin which is secured to the lever I. From this description it will be seen that when the lever G is depressed it presses down the lever I, so that the small pin secured to the lever I acts upon the lever J and carries its forked end downward, thus releasing the lower prong of the forked portion of the lever J from engagement with the short arm of the lever C, bringing into play the spring K, which presses the long arm of the lever C into engagement with the cam D. When the lever C is out of engagement with the cam D, said lever rests against a pin T, as shown in Fig. 2, which serves to limit the upward movement of the levers I and G.

A retaining-pawl L, which is spring-actuated, acts upon the teeth of the spur-wheel E, which, as shown in Fig. 2 of the drawings, are pointed and known as "star-teeth," and by the slight play or lost motion in the train of gears operating the spur-wheel E the pawl jumps after sufficient strain is placed upon the gear by the train from one tooth to another, thus causing the stylus to always come in perfect alinement with the rings upon the record-disk.

Motion is imparted to the record-disk by mechanism independent of the mechanism for operating the watch. In the present instance the lower part of the record-disk F is a toothed wheel which meshes with a toothed wheel M, which in turn engages a gear-wheel mounted upon and carried by the spring-drum N, which is of ordinary construction.

I prefer to wind the spring-drum operating the watch-movement and the spring-drum operating the record-disk by the same stem or winding device.

The stem O, which is of ordinary construction, I provide with a bracket P, which has two arms, each of which carries a pinion R, the said bracket being held in frictional contact, so as to be caused to move either to the right or to the left with the motion of the winding-stem, this frictional contact being established by means of a screw in the stem acting against the spring-washer Q, which bears against the bracket. Thus it will be seen that by turning the stem in one direction the bracket P will move and carry one of the gears R into engagement with the spring-drum on one side of the stem and by a reversal of said movement the opposite gear R

will be brought into action and the other of the spring-drums will be acted upon.

In Fig. 4 of the drawings I have shown the manner in which the stylus-lever A is pivoted to the support or framework U and the shaft and minute-hand of the watch, which is provided with the usual pinion X, operated upon by the usual watch mechanism.

The sound produced by the stylus A and diaphragm Z is conveyed through an opening in the cover Y, as shown in Fig. 5. In the cover Y is also secured a leaf-spring W, which rests upon the edge of the record-disk and returns to its initial position after the lever G has been released. The watch mechanism is of the usual character, and the watch is provided with the usual pin S, by which means the hands of the clock may be set.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination with the mechanism of a watch or clock, a sound-reproducing machine comprising a record-disk, means for rotating the same, a diaphragm, a stylus-lever provided with a stylus adapted to the record and to said diaphragm, a cam driven by the watch mechanism adapted to move the stylus and stylus-lever across the record, and means as shown for moving the record-disk into and out of engagement with the stylus.

2. In combination with the watch or clock mechanism, a record-disk, means as shown for rotating the same, a stylus-lever provided with a stylus adapted to the record-disk, a diaphragm acted upon by the stylus-lever, a cam driven by suitable gearing from the minute-hand shaft, said cam being arranged to move the stylus and its lever across the face of the record-disk, and means as shown and described for moving the record-disk into and out of engagement with the stylus.

3. In combination with a clock or watch, a record-disk mounted upon a central shaft rotated by spring means through a train of gearing, a stylus-lever provided with a stylus adapted to traverse concentric rings upon the record-disk, a diaphragm adapted to be acted upon by the stylus-lever, means as shown and described to move the record-disk into and out of engagement with the stylus, a cam controlled by the minute-hand shaft through the medium of gearing for conveying the stylus across the face of the record-disk; means as shown to convey the stylus into and out of engagement with said cam, and a pawl adapted to a spur-wheel carrying said cam to determine the position of the stylus with respect to the record.

4. In combination with the clock or watch mechanism a record-disk mounted upon a central shaft, spring mechanism for rotating said shaft, a stylus-lever as shown, provided with a stylus adapted to the record, a diaphragm adapted to be vibrated by the stylus-lever, a cam controlled by the clock or watch mechanism through the medium of the min-

ute-hand shaft, said cam being arranged to carry the stylus-lever and stylus across the face of the record-disk, a spring-actuated lever adapted to move the record-disk into and out of engagement with the stylus and simultaneously move the stylus-lever into and out of engagement with said cam, and a pawl to engage the spur-wheel carrying said cam, for the purpose specified.

5 5. In combination with the clock or watch mechanism, a record-disk mounted upon a shaft, spring mechanism for rotating said shaft, a stylus-lever as shown, provided with a stylus adapted to the record, a vibrating diaphragm adapted to be acted upon by the stylus-lever, a cam for operating the stylus-lever controlled by the watch mechanism, through the medium of the minute-hand shaft and gearing, and a lever adapted to move the record-disk into and out of engagement with the stylus and simultaneously move the stylus into and out of engagement with said cam.

10 6. In combination with the clock or watch

mechanism, a record-disk mounted upon a central shaft, spring mechanism for rotating said shaft, a stylus-lever as shown, provided with a stylus adapted to the record, a diaphragm in contact with the stylus-lever, a cam for operating the stylus-lever controlled by the watch mechanism through the medium of the minute-hand shaft and gearing; a lever adapted to move the record-disk into and out of engagement with the stylus and simultaneously move the stylus-lever into and out of engagement with said cam, and a winding-stem provided with mechanism as shown so as to be capable of winding the spring of the watch mechanism when turned in one direction, and the spring controlling the record-disk when turned in the opposite direction.

15 20 In testimony whereof I affix my signature in presence of two witnesses.

CASIMIR SIVAN.

Witnesses:

E. A. STOREY,

E. F. BARRY.

(No Model.)

2 Sheets—Sheet 1.

J. W. JONES.
SOUND REPRODUCING MACHINE.

No. 605,484.

Patented June 14, 1898.

FIG. 1.

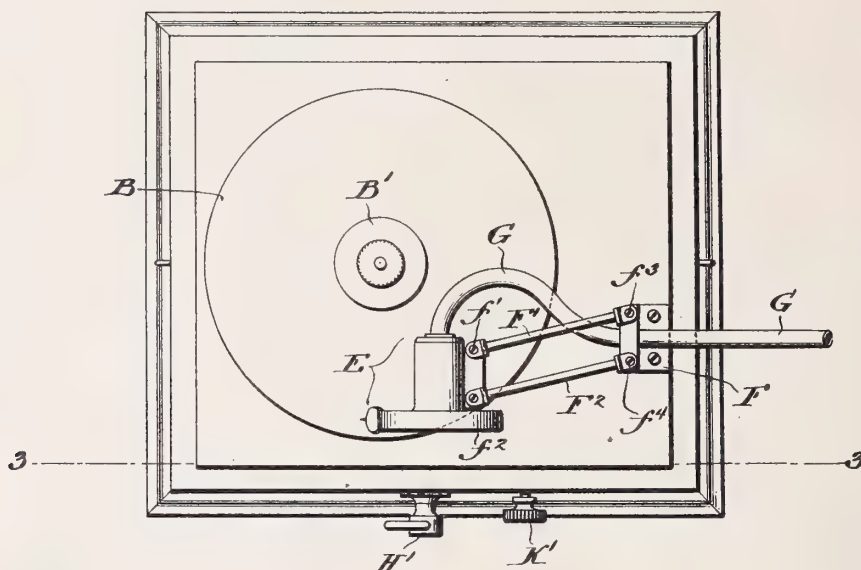
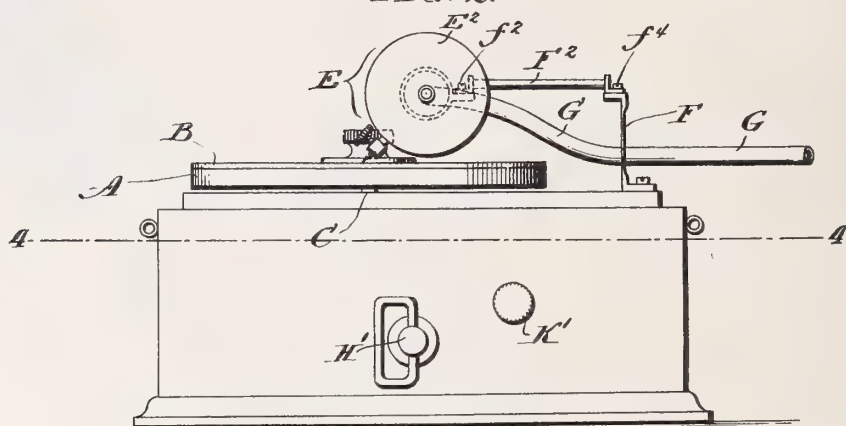


FIG. 2.



WITNESSES:

INVENTOR

Witness
James E. Hewes.

Joseph W. Jones
By his Attorney
Saml. Williams

J. W. JONES. SOUND REPRODUCING MACHINE.

No. 605,484.

Patented June 14, 1898.

FIG. 3.

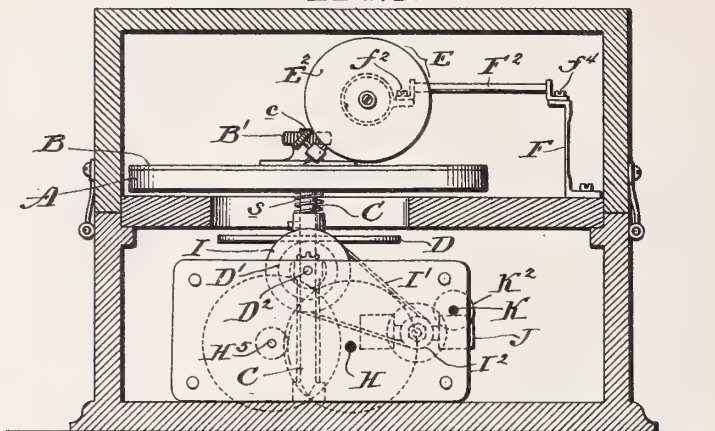


FIG. 5.

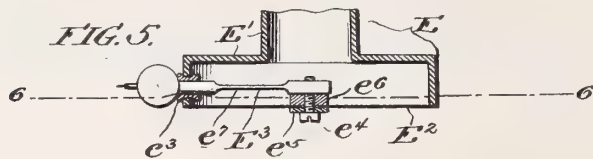


FIG. 4.

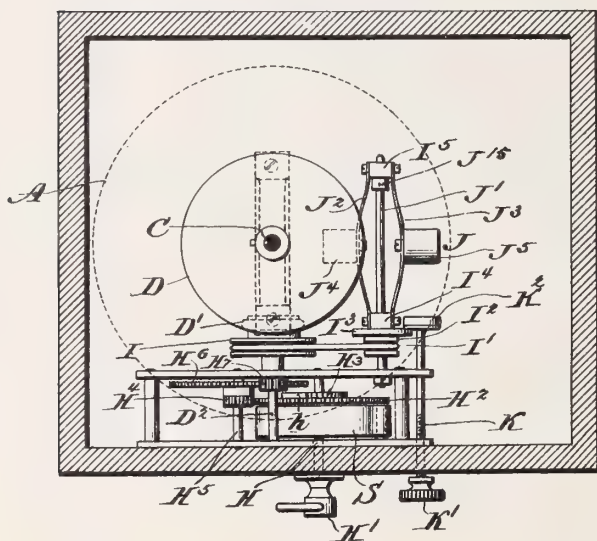
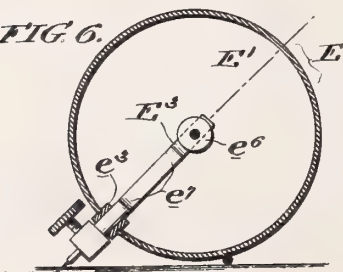


FIG. 6.



WITNESSES:

James E. Hewes.

INVENTOR

Joseph W. Jones
by his Attorney
Robert S. Williams

UNITED STATES PATENT OFFICE.

JOSEPH W. JONES, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
HIMSELF AND JOSEPH A. VINCENT, OF SAME PLACE.

SOUND-REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 605,484, dated June 14, 1898.

Application filed May 13, 1897. Serial No. 636,294. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH W. JONES, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Sound-Reproducing Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in sound-reproducing machines, more particularly that class known as "gramophones," in which the sound-record employed consists of an irregular groove of even depth formed upon a flat disk, the stylus controlling the diaphragm being fed along by resting in and following the helical groove as the disk is being rotated.

My aim is to construct a simple and inexpensive toy machine which will embody all the quality of tone of a more expensive and elaborate machine and to overcome certain defects which I find to exist in the more expensive forms of gramophones and which are greatly magnified as the size of the instrument is reduced.

The main features embodied in my improvements are, first, the construction and arrangement of the sound-box, diaphragm, and stylus; second, means for guiding the sound-box and stylus and regulating the tension of the stylus-point upon the record; third, means for governing the speed of the motor operating the machine, and, fourth, in the general construction and arrangement of the parts, which will be more fully treated of hereinafter.

Referring to the accompanying drawings, Figure 1 illustrates a plan view of a gramophone embodying my improvements, the top cover of the instrument being removed. Fig. 2 is a side elevation of what is shown in Fig. 1. Fig. 3 is a vertical sectional view taken on the line 3 3 of Fig. 1. Fig. 4 is a horizontal sectional view on the line 4 4 of Fig. 2. Fig. 5 is a horizontal sectional view of the sound-box detached and enlarged, and Fig. 6 is a vertical section of the sound-box on the line 6 6 of Fig. 5.

Referring to the letters of reference marked upon the drawings, A indicates a circular table upon which the record-disk B is placed and firmly held in place by a thumb-screw B', which is threaded to engage a projecting portion *c* of the vertical shaft C, which supports said table. The table A not only acts as a support for the record-disk B, but is made of sufficient weight and thickness to act as a balance or fly wheel to more readily act in conjunction with the governor to regulate the speed of the machine.

Suitably guided upon the shaft C, below the table A, is a disk D, acted upon by a spring S, said disk being operated upon by a friction-wheel D', mounted upon the shaft D², which is driven by spring means, more fully described hereinafter.

Not the least important feature of my invention is the sound-box E, which comprises the shell or casing E', to which is secured by soldering or brazing the diaphragm E². A lever E³ passes through the rim of the sound-box and is cushioned to prevent the rasping and grating sounds commonly heard in talking-machines, caused by metallic working surfaces coming together in the working portion of the sound-box. To overcome this defect, I surround the lever E³ at its point of fulcrum with a ring or cushion *e*³ of rubber, which permits of a slight universal movement. The lever E³ is joined at one end to the diaphragm E² by a screw *e*⁴, which is separated from the diaphragm, and in like manner the diaphragm is separated from the lever E³ by cushions *e*⁵ and *e*⁶. I further desire to destroy harsh and grating sounds caused by minute irregularities in the true sound-waves, which I accomplish by reducing the thickness of the bar E³ at a point *e*⁷, thus allowing the bar to move the reduced portion *e*⁷, which acts as a spring to take up the delicate movements caused by the irregularities above referred to.

One of the important features of my invention is the means employed to guide the sound-box and stylus across the face of the record-disk, so that the stylus will at all times assume the same relative position in the record-groove, and the sound-box will move in a plane parallel to a horizontal line drawn

across the face of the record-disk. By this arrangement I reduce the tendency of the stylus to leave the groove of the record, which frequently occurs where a short arm is employed, causing the sound-box and stylus to assume a radial position in respect to the point of fulcrum. The tone of the instrument is greatly improved by this means of guiding the sound-box and the life of the record is greatly prolonged.

The sound-box E is connected to the bracket F by the parallel rods F' and F'' , which are hinged to the sound-box by screws f' and f'' and to the bracket F by the screws f^3 and f^4 . By the use of these short parallel rods I find that the stylus, which is caused to assume the same plane with respect to the record, imparts with greater force and more accuracy the sound-waves of the record, the great weight of the long arm commonly employed is overcome, and the whole construction is made more compact. The bracket F in addition to acting as a support for parallel rods F' and F'' also imparts a spring-tension to the sound-box and stylus and causes the latter to bear with a yielding tension against the record-disk.

As shown in Figs. 1 and 2, the sound is conveyed from the sound-box E by a tube G, which is guided by an opening in the bracket F.

The motor for rotating the table A comprises a winding-shaft H, provided with a key H' , a spring S, the inner end of which is secured to said shaft, while the outer end is secured to the framework of the motor. The gear-wheel H^2 is hung loosely upon the shaft H and is provided with a pawl h , which engages the teeth of a ratchet-wheel H^3 , which is firmly secured to the shaft H. The gear H^3 meshes with a pinion H^4 upon a shaft H^5 , which carries a gear-wheel H^6 , the same meshing with a pinion H^7 upon the shaft D².

Secured to the shaft D² is a grooved pulley I, provided with an elastic belt I', which imparts motion to a pulley I², controlling the governor.

The governor J consists of a fixed shaft J', secured to the framework of the motor. The pulley I² is united to or has formed therewith a disk I³ and a hub I⁴. The springs J² and J³ of the governor are provided with weights J⁴ and J⁵, which are secured at their ends to the hubs I⁴ and I⁵, which rotate, together with said springs, upon the fixed shaft J', a collar J⁶ upon said shaft serving to hold the hub I⁵ in position against the action of said springs.

From the above description it will be readily seen that as the governor rotates the pulley I², disk I³, and hub I⁴ will travel back and forth upon the shaft J' as the speed varies. In order to control the speed of the machine, I provide an adjustment in the form of a threaded rod K, which is provided at one end with a thumb-screw K' for turning and adjusting the same. At the other end of the rod I provide a padded disk K², which may be brought to bear upon the disk I³, and thereby limit

the speed of the machine by frictional contact.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A sound-reproducing machine comprising a rotatable table, a record thereon, spring means for rotating said table, a sound-box provided with a diaphragm and stylus, a bracket secured to the framework of the machine and short parallel rods pivoted to said bracket and to the sound-box, substantially as specified.

2. A sound-reproducing machine comprising a rotatable table, a record-disk detachably secured thereto, spring means for rotating said table, a sound-box provided with a diaphragm, and stylus, the latter having a bar interposed between the diaphragm and sound-box provided with an annular cushion supported by the rim of the sound-box, and cushions at the point where the bar is united to the diaphragm, a bracket connected to the framework of the machine, parallel rods pivoted to said bracket and to a projecting ledge upon the sound-box, substantially as specified.

3. A sound-reproducing machine comprising a rotatable table, a record detachably secured thereto, spring means for rotating said table, a sound-box provided with a diaphragm and stylus operated upon by the record, a flexible bracket secured to the frame of the machine, two parallel rods each of which is pivoted at opposite ends to the sound-box and flexible bracket, a governor upon the operating mechanism and means independent of the action of the governor for regulating the speed of the mechanism.

4. A sound-reproducing machine comprising a rotatable table mounted upon a vertical shaft, a record-disk detachably secured thereto, a driving-disk feathered to said shaft and held in frictional contact with the driving mechanism by a spring, spring mechanism for operating the driving-disk, a sound-box provided with a diaphragm and stylus operated upon by the record and parallel rods pivoted to the sound-box and to a bracket mounted upon the framework of the machine.

5. A sound-reproducing machine comprising a rotatable table, mounted upon a vertical shaft, a record-disk detachably secured thereto, a driving-disk feathered to said shaft and operated upon by a spring, a pulley for rotating said disk mounted upon a horizontal shaft, rotated by spring mechanism, a governor driven by a flexible belt from said shaft, a disk upon one of the movable parts of said governor, an adjusting-screw having upon one end a disk and pad which is capable of being brought into and out of contact with the disk of the governor for regulating the speed of the operating mechanism, a sound-box provided with a diaphragm and stylus, operated upon by the record, and parallel rods for guiding the sound-box, pivoted to the latter

and to a bracket mounted upon the framework of the machine.

5 6. A sound-box for a sound recording or reproducing machine, consisting of a flexible stylus-lever inclosed within the sound-box and fulcrumed to the wall of the same by an annular ring of elastic material, one end of said stylus being connected to the diaphragm through the medium of a screw and cushion,

and the opposite end being provided with a detachable stylus.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH W. JONES.

Witnesses:

JAMES E. HEWES,
JOHN R. NOLAN.

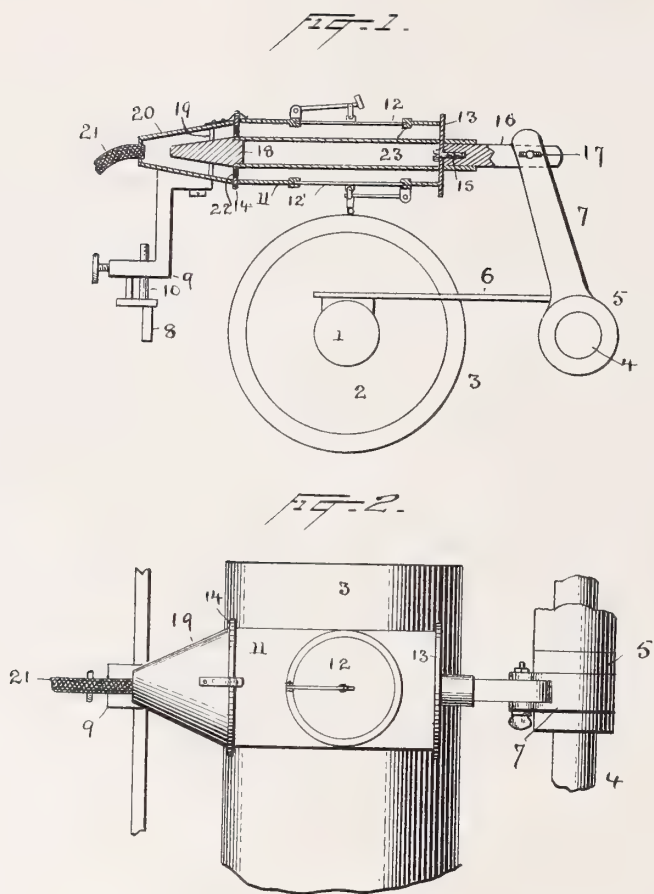
(No Model.)

2 Sheets—Sheet 1.

T. A. EDISON.
PHONOGRAPH.

No. 605,667.

Patented June 14, 1898.



Witnesses
Norris A. Clark.
Nicholas F. Oberli

Inventor
T. A. Edison.
By his Attorneys
Dye & Seely.

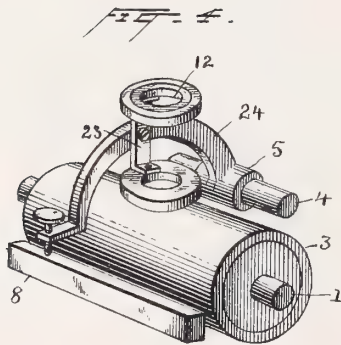
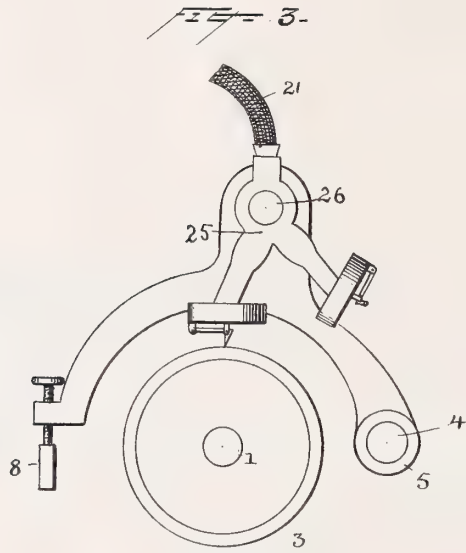
(No Model.)

2 Sheets—Sheet 2.

T. A. EDISON.
PHONOGRAPH.

No. 605,667.

Patented June 14, 1898.



Witnesses
Morris A. Clark
Nicholas F. Clark

Inventor
T. A. Edison,
By his Attorneys
Syert Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 605,667, dated June 14, 1898.

Application filed December 3, 1890. Renewed February 4, 1897. Serial No. 622,021. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 890,) of which the following is a specification.

This invention relates to means for throwing a phonograph-recorder out of operative position and throwing the reproducer into operative position, or vice versa, in that class of phonographs which have a separate diaphragm for the recorder and for the reproducer. I have heretofore proposed to support the two diaphragms and the recorder and reproducer, respectively, in the two sides of a spectacle-frame, which frame is pivoted so that it can be swung from one side to the other, usually in a plane nearly tangential to the surface of the phonogram-blank, to bring either diaphragm in communication with the speaking or hearing tube. This arrangement is described and claimed in my Patent No. 386,974, dated July 31, 1888. The present invention provides an improved apparatus to accomplish the same result as the spectacle-frame. In two forms of this apparatus the recorder and reproducer are mounted on a supporting-frame or a tube which is adapted to be rotated, preferably, in a plane at right angles to the direction of rotation of the phonogram-blank, and is not merely adapted to be swung back and forth, as is the old spectacle-frame, and in another form a swinging frame is employed.

In the accompanying drawings, which illustrate the invention, Figure 1 is a sectional view of an apparatus, showing the invention. Fig. 2 is a plan view thereof, and Figs. 3 and 4 are views of modified forms.

1 is the phonograph-shaft, 2 the phonograph-cylinder, and 3 the phonogram-blank.

4 is a guide-rod on which the sleeve 5 is adapted to slide. To said sleeve is connected the usual feed-arm 6 and also an upward extension 7, forming a part of the recorder and reproducer carrying arm. At the opposite side of the blank is a guide-bar 8, on which the end 9 of the recorder-carrying arm is adapted to bear, preferably through or by means of the automatic determining devices

10 of the character described by me heretofore. Between the two ends of the carrying-arm is inserted a hollow tube or frame 11, of any desired shape in cross-section. In different sides of this tube or frame, preferably diametrically opposite each other, are placed diaphragms 12 12', to which are connected the recorder and reproducer, respectively. The tube or frame is supported between two plates or disks 13 14, the former being adapted to rotate on the bearing 15, which is shown screwed into the end of the rod or bar 16, which in turn is united with arm 7 by means of a bolt or other suitable device 17. The opposite disk is adapted to turn on one end of the plug 18, which is supported by means of braces 19 within the cone-shaped sleeve 20. This latter sleeve is secured to the section 9 of the feed-arm and moves along with it.

21 is a hearing or speaking tube communicating with the conical sleeve 20, and through the same communicating with the interior of tube 11, the disk 14 being provided with slots or openings 22 for the purpose of allowing the passage of the air-waves. The disk 14 is also provided with means for holding it in the desired position. This means may consist of notches in the edge of the disk and a spring secured to sleeve 20 and adapted to bear in said notches. Within the tube 11 is preferably placed a second tube 23.

With the arrangement above described it will be seen that the hollow frame or tube supporting the recorder and reproducer forms a part of the supporting-arm and that the speaking and hearing tube is always in connection with the hollow arm and with the recorder or the reproducer carried thereby.

To use the device, supposing the reproducer to be in position on the phonogram-blank, as shown in Fig. 1, the tube is turned—for example, by grasping the disk 14—through one hundred and eighty degrees. In this position the recorder will occupy the position first occupied by the reproducer and the locking-spring will fall into a second notch in the disk 14. When the act of recording is completed, another half-turn may be given to the tube or frame, thus again reversing the position of recorder and reproducer.

In Fig. 4 the recorder and reproducer are mounted at opposite ends of an arm 23, which

is pivoted at its center to the arm 24. The friction at the pivot is sufficient to hold the recorder and the reproducer in position when they are set for use. By turning 23 on its pivot in either direction the recorder can be thrown out of operative position and the reproducer into such position, or vice versa.

In Fig. 3 the recorder and reproducer are mounted on the frame 25, pivoted on 26, and having passages leading to the recorder and the reproducer. The speaking and hearing tube 21 is always in communication with said passages. The pivot 26 is on the recorder and reproducer carrying arm, and the frame 25, carrying the recorder and reproducer, swings in a plane directly crossing the phonogram-blank.

Having thus described my invention, what I claim is—

1. A combined recording and reproducing device for phonographs, comprising a reversible diaphragm-holder, a recording-point on one side and a reproducing-point on the other side, whereby by reversing the holder either the recording or reproducing point may be brought into operative position, substantially as set forth.

2. The combination, in a phonograph having a suitable phonogram-blank, of a hollow structure, and recording and reproducing devices in different sides thereof, said structure being arranged to move on its axis to bring the recorder or the reproducer into operative position, substantially as described.

3. The combination with a support for a phonograph recorder and reproducer, consisting of a tube, of said recorder and reproducer mounted in different sides of the tube, substantially as described.

4. The combination of a support for a phonograph recorder and reproducer, consisting of a tube mounted to rotate in different sides of which said recorder and reproducer are mounted, and an inner tube, substantially as described.

5. The combination of a support for a phonograph recorder and reproducer, consisting of a tube mounted to rotate, in different sides of which said recorder and reproducer are mounted, said tube being connected to the phonograph-feeding devices, substantially as described.

6. A recorder and reproducer carrying arm,

a portion of which is tubular in combination with the recorder and reproducer, substantially as described.

7. A recorder and reproducer carrying arm having end sections and a journaled tube interposed between said sections in combination with a recorder or reproducer supported by the tube, substantially as described.

8. The combination of a support for a phonograph recorder and reproducer, consisting of a tube mounted to rotate, and a speaking or hearing tube communicating with one end of said tube, substantially as described.

9. The combination of a support for a phonograph recorder and reproducer, consisting of a tube mounted to rotate, an inner tube, and a speaking or hearing tube communicating with the space between the two tubes, substantially as described.

10. The combination with a guide-rod, a sleeve thereon to which the recorder-supporting arm is connected, and a guide-bar on which the arm bears, of said supporting-arm, and a recorder and reproducer mounted on different sides thereof but movable into and out of operative position, substantially as described.

11. The combination with a support mounted to rotate repeatedly in the same direction, of a phonograph-recorder on one side thereof, and a reproducer on another side, substantially as described.

12. The combination, with a support movable repeatedly in the same direction, of a recorder thereon at one side, and a reproducer thereon on a different side, and means for holding the support in the position to which it is turned, substantially as described.

13. In a talking-machine, the combination with the carriage and the tablet-carrying cylinder, of a pivoted holder adapted to carry a recording and transcribing diaphragm and so formed that said diaphragms will be held in a different plane with respect to each other, and means for bringing either of said diaphragms into contact with the tablet, as and for the purpose set forth.

This specification signed and witnessed this 1st day of December, 1890.

THOS. A. EDISON.

Witnesses:

JOHN F. RANDOLPH,
W. PELZER.

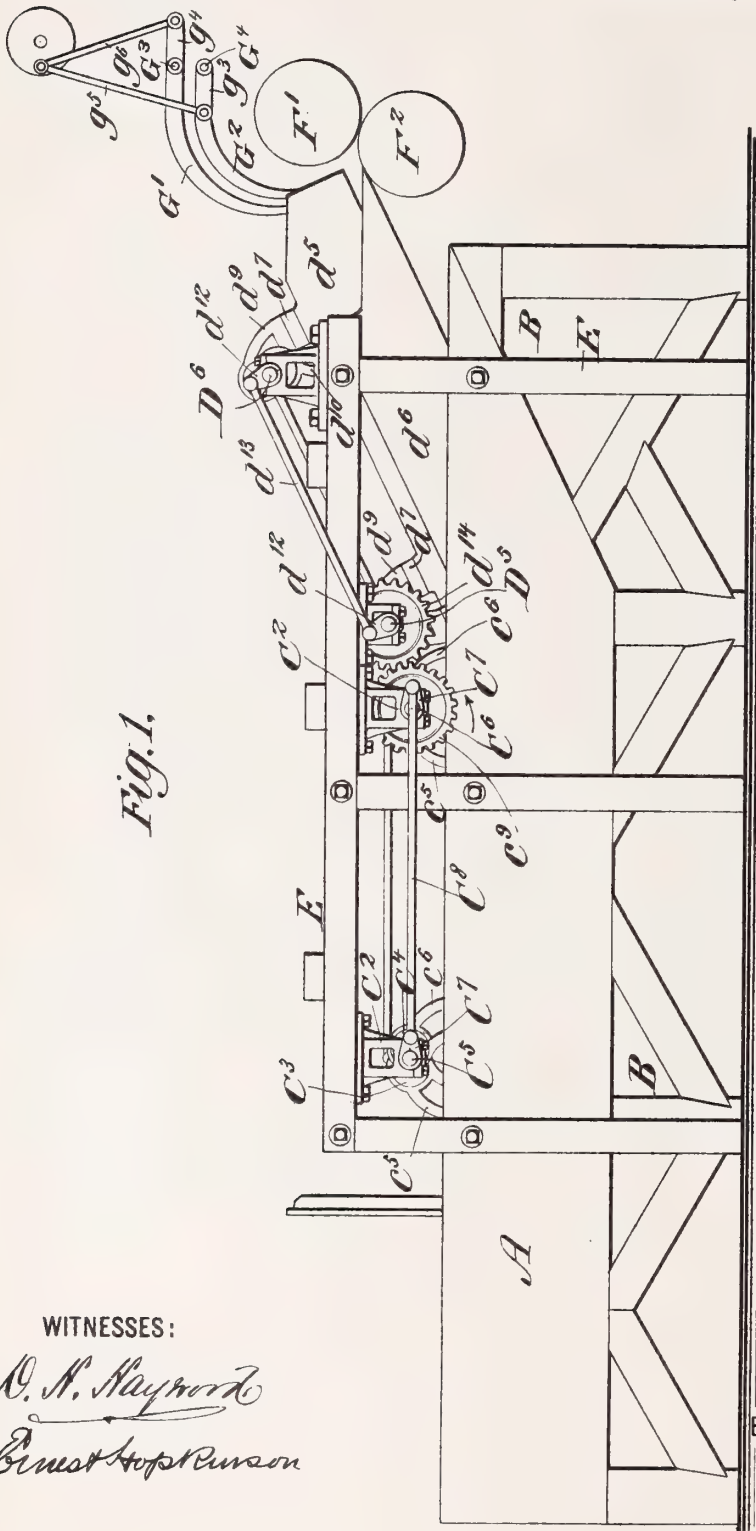
(No Model.)

3 Sheets—Sheet 1.

O. S. HARMON.
MACHINE FOR TREATING TOBACCO.

No. 606,209.

Patented June 28, 1898.



WITNESSES:

N. H. Hayward
Ernest H. Benson

INVENTOR

Orville S. Harmon

BY

Edwin H. Brown

his ATTORNEY

(No Model.)

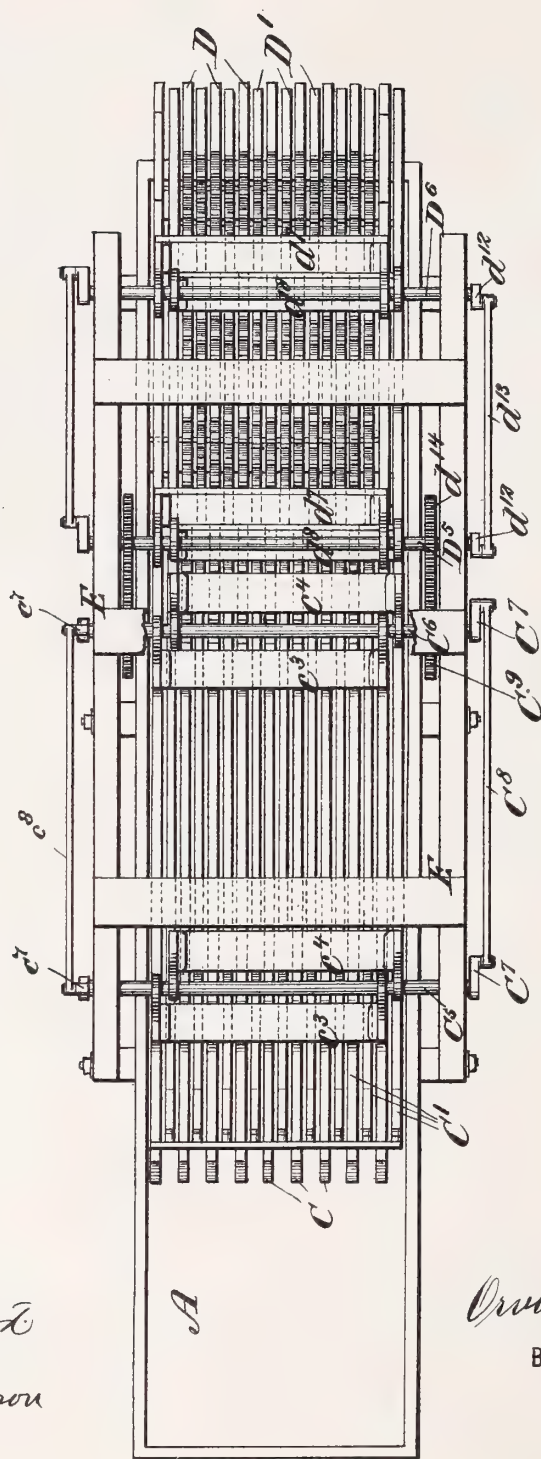
3 Sheets—Sheet 2.

O. S. HARMON.
MACHINE FOR TREATING TOBACCO.

No. 606,209.

Patented June 28, 1898.

Fig. 2.



WITNESSES:

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Ernest Hopkinson

INVENTOR

Orville S. Harmon

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Edwin H. Brown

his ATTORNEY

(No Model.)

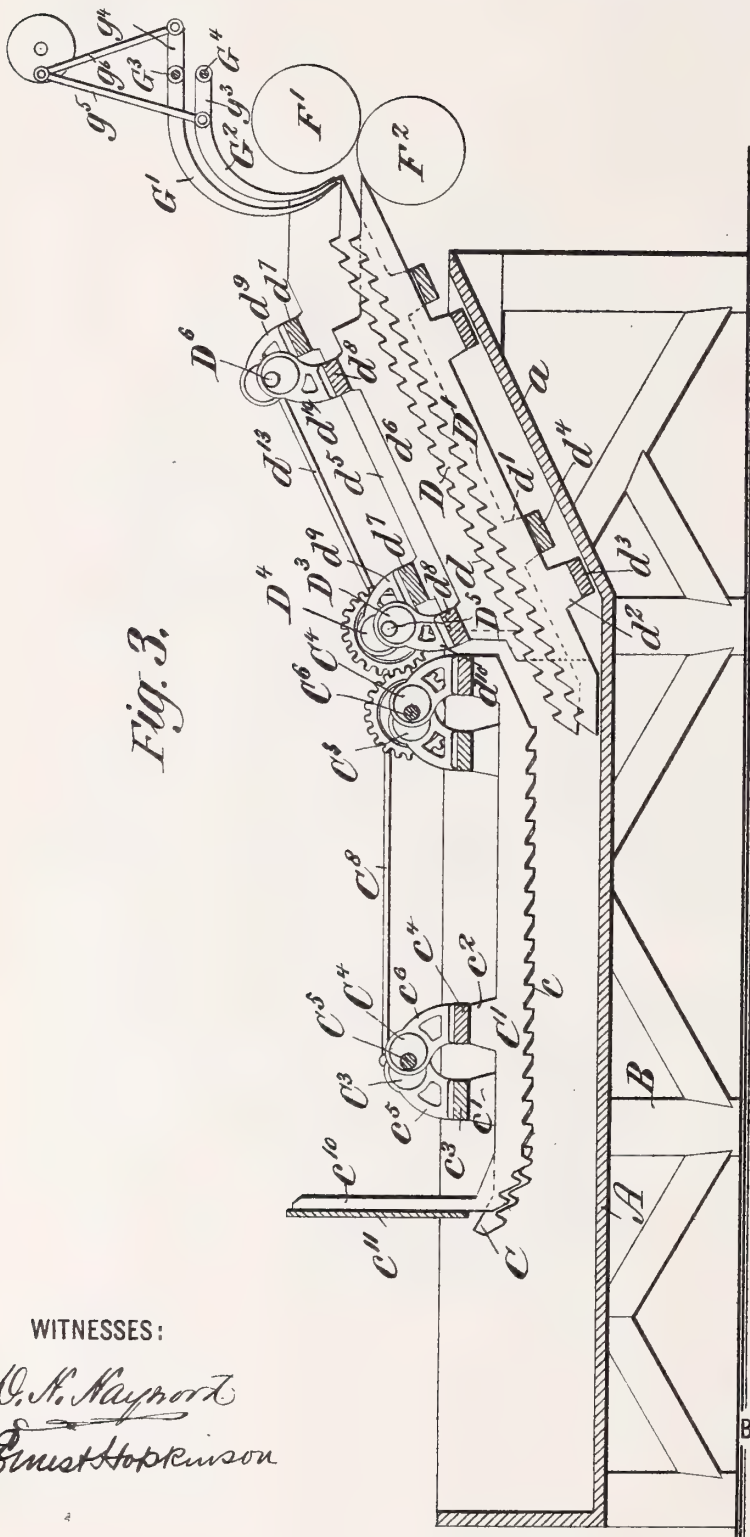
3 Sheets—Sheet 3.

O. S. HARMON.
MACHINE FOR TREATING TOBACCO.

No. 606,209.

Patented June 28, 1898.

Fig. 3.



WITNESSES:

O. S. Harmon
Ernest Hopkinson

INVENTOR

O. S. Harmon

BY

Edwin S. Brown
his ATTORNEY

UNITED STATES PATENT OFFICE.

ORVILLE S. HARMON, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE P. LORILLARD COMPANY, OF JERSEY CITY, NEW JERSEY.

MACHINE FOR TREATING TOBACCO.

SPECIFICATION forming part of Letters Patent No. 606,209, dated June 28, 1898.

Application filed June 20, 1896. Serial No. 596,255. (No model.)

To all whom it may concern:

Be it known that I, ORVILLE S. HARMON, of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Machines for Treating Tobacco with Liquid, of which the following is a specification.

I will describe a machine embodying my improvement and then point out the novel features in the claims.

In the accompanying drawings, Figure 1 is a side view of a machine embodying my improvement. Fig. 2 is a plan of the same, certain parts at the delivery end being omitted. Fig. 3 is a central longitudinal section.

Similar letters of reference designate corresponding parts in all the figures.

A designates a tank, which may be made of any suitable material and form. Most advantageously it may be made of rectangular form and erected upon a framework—such, for example, as the framework B. It has an inclined bottom section *a*. Liquid as it is ordinarily used for treating tobacco will be kept in the tank up to a suitable level. Liquid may be supplied by any suitable means, preferably under automatic regulation.

Leaves or pieces of tobacco are introduced at one end and are moved forward to the delivery end by means of reciprocating bars C C' D D'. The reciprocating bars C C' have on their lower edges teeth *c* somewhat resembling ordinary saw-teeth, although made less sharp at the points. The bars D D' have corresponding teeth *d*, but they are located on the upper edges. It will be observed that the teeth *c* of the bars C C' have their points arranged in the direction of the delivery end of the tank, and that this is also true of the teeth *d* of the bars D D'.

The bars C C' have upwardly-extending arms *c'* *c''*, which are connected to cross-bars *c³* *c⁴*. From these cross-bars extend upwardly arms *c⁵* *c⁶*, that are fitted to eccentrics C³ C⁴, mounted upon shafts C⁵ C⁶. These shafts are journaled in bearings C², arranged beyond the sides of the tank and affixed to a framework E.

The eccentrics C³ C⁴ on the shaft C⁵ are set reversely and so are the eccentrics C³ C⁴ on the shaft C⁶, the eccentrics C³ on the two

shafts C⁵ C⁶ being set alike and the eccentrics C⁴ on said shafts being also set alike.

On the shafts C⁵ C⁶ are cranks C⁷, those on one side of the machine being at right angles to those on the opposite side, being connected by rods C⁸. On the shaft C⁶ is a gear *c⁹*. By rotating the gear *c⁹* both shafts C⁵ C⁶ will be rotated, and thus the eccentrics C³ C⁴ will be rotated. Thus the two sets of bars C C' will be moved downward and at the same time toward the delivery end of the tank A, then upward, and, while elevated, back to the starting position. The motions of each of the two sets of bars C C' are always the reverse of those of the other series. Hence these two series of bars alternate in their movements toward the delivery end of the tank A.

The bars D D' are provided with arms *d'* *d''*, which are fastened to cross-bars *d³* *d⁴*. The cross-bars *d³* *d⁴* are fastened to bars *d⁵* *d⁶*.

The bars *d⁵* *d⁶* are connected by cross-bars *d⁷* *d⁸*, and from these extend upwardly arms *d⁹* *d¹⁰* to eccentrics D³ D⁴, affixed to shafts D⁵ D⁶. These shafts D⁵ D⁶ are mounted in bearings *d¹¹*, affixed to the framework E, and arranged wholly beyond the sides of the tank. The eccentrics D³ D⁴ of the shaft D⁵ are set reversely, and so are the eccentrics D³ D⁴ of the shaft D⁶. Hence when the said shafts and eccentrics rotate each of the series of bars D D' will move reversely to the other and each will have a motion upward and forward toward the delivery end of the tank and then downward and rearward to the starting position, the movements of each of the two series of bars being the reverse of those of the others.

On the shafts D⁵ D⁶ are cranks *d¹²*, which are similarly set upon said shafts and are connected by a rod *d¹³*. On the shaft D⁵ is a gear-wheel *d¹⁴*, which meshes with the gear-wheel *c⁹* on the shaft C⁶. Either the shaft C⁶ or the shaft D⁵ will be provided with a belt-pulley, by which all of the described parts of the machine may be operated.

It will be seen that by means of the two series of bars C C' leaves of tobacco inserted at the receiving end of the tank A will be forced downward within the liquid in the tank and moved forward until they reach the two series of bars D D', when they will be

moved upward and forward until they are withdrawn from the liquid in the tank and delivered entirely from the tank. One of the series of bars C C'—as, for example, the series of bars C'—will be provided with upturned portions c^{10} , whereby a board c^{11} will be supported across the tank A. This will preclude leaves of tobacco from passing toward the delivery end of the tank above the bars C C'.

Preferably the rear ends of the bars C C' will be inclined to facilitate moving the leaves of tobacco downward to the under side of the main portions of the bars.

Obviously the bars C C' will not only move the tobacco forward, but will also agitate it, so that it may be thoroughly subjected to the liquid in the tank and will soak up the same. Equally efficacious will the bars D D' be for shaking the tobacco-leaves as they are moved from the liquid for the purpose of facilitating the draining off of the superfluous liquid.

At the delivery end of the tank I have shown rollers F' F², which will receive the tobacco and carry it forward to a suitable receptacle. These rollers may be driven in any suitable manner.

With the rollers F' F² are preferably combined two sets of fingers G' G², affixed to rock-shafts G³ G⁴, mounted in bearings supported in a suitable framework. To these rock-shafts are affixed crank-arms $g^3 g^4$. Rods $g^5 g^6$ extend from these crank-arms $g^3 g^4$ to a crank carried by a rotary shaft G, which is journaled in a suitable framework and driven by any suitable means.

The fingers G' G² are curved and their forward extremities are capable of projecting quite close to the meeting surface of the rollers F' F². They vibrate toward and away from this space and alternate with each other in the forward movements. They aid in delivering the tobacco to the rollers and prevent clogging.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination with a tank, of two series of horizontal parallel bars having downwardly-projecting teeth and operating above and entirely clear of the bottom of the tank, the bars of one series alternating with those of the other series, means comprising two sets of reversely-set eccentrics, one set at each end of said bars, and connections between said bars and eccentrics for moving the two series of bars in reverse order, downwardly, forwardly, upwardly and rearwardly, substantially as specified.

2. The combination with a tank, of two series of horizontal parallel bars having downwardly-projecting teeth and operating above and entirely clear of the bottom of the tank, the bars of one series alternating with those of the other series, means comprising two sets of reversely-set eccentrics respectively arranged at opposite ends of said bars, for moving the two series in reverse order, down-

wardly, forwardly, upwardly and rearwardly, and cranks and a connecting-rod for causing the two sets of eccentrics to move in unison, substantially as specified.

3. The combination with a tank having a horizontal bottom section, and an upwardly-inclined bottom section, of two sets of toothed bars, one set having teeth on the lower side and overlying and being parallel with said horizontal section and operating above and clear thereof, and the other set having teeth on the upper side and overlying and being parallel with said inclined section, and means for reciprocating said sets of bars, substantially as specified.

4. The combination with a tank having a bottom provided with a horizontal section, and an upwardly-inclined section, of two sets of toothed bars respectively above and lying parallel with said bottom sections, the teeth of the horizontal bars projecting downwardly and those of the inclined bars projecting upwardly, and means for simultaneously reciprocating said sets of bars, substantially as specified.

5. The combination with a tank having a bottom provided with a horizontal section, and an upwardly-inclined section at its delivery end, of two sets of bars, one set having teeth on the lower side and arranged above and parallel with said horizontal bottom section, and the other set having teeth on the upper side and arranged above and parallel with said inclined bottom section, and each set of bars comprising two series of alternately-arranged bars, reversely-set eccentrics at opposite ends of said bars, and connections between said eccentrics and series of bars for simultaneously moving the series of each set in opposite directions, substantially as specified.

6. The combination with a tank, of bars, roughened or toothed on their upper surfaces and extended upwardly out of the tank at the delivery end, means for reciprocating said bars, rollers adjacent to the upper end of said bars, and fingers oscillating opposite the said rollers, substantially as specified.

7. The combination with a tank, of bars, roughened or toothed on their upper surfaces and extended upwardly out of the tank at the delivery end, means for reciprocating said bars, rollers adjacent to the upper end of said bars, and two sets of fingers oscillating opposite the said rollers, substantially as specified.

8. The combination with a tank, of horizontal bars roughened or toothed on their under edges, and provided at their infeed ends with upwardly-inclined sections likewise roughened or toothed, substantially as specified.

9. The combination with a tank, of bars, roughened or toothed on their under edges, a stop board or piece attached to such bars, and means for moving the bars downwardly, forwardly, upwardly and rearwardly, substantially as specified.

10. The combination with a tank, of horizontal bars roughened or toothed on their under

edges, and provided at their infeed ends with upwardly-inclined sections likewise roughened or toothed, a stop-board supported by the bars above said inclined sections, and
5 means for reciprocating the bars, substantially as specified.

11. The combination with a tank, of horizontal parallel bars roughened or toothed on their lower sides and operating above and entirely
10 clear of the bottom of the tank, means for moving said bars downwardly, forwardly, upwardly and rearwardly, shafts supporting

said means, bearings for said shafts, and supports for said bearings independent of and beyond the sides of the tank, substantially 15 as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ORVILLE S. HARMON.

Witnesses:

ERNEST HOPKINSON,
R. LAWSON.

No. 606,725.

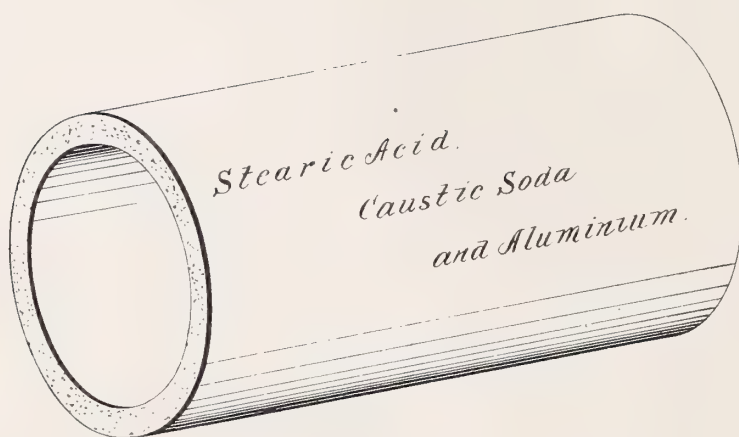
Patented July 5, 1898.

T. H. MACDONALD.

MANUFACTURE OF GRAPHOPHONE TABLETS.

(Application filed Nov. 27, 1896.)

(No Model.)



Witnesses

W. R. Edison

Am. Lewis.

Inventor

Thomas H. Macdonald,
by John Mauro,
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT
OF COLUMBIA.

MANUFACTURE OF GRAPHOPHONE-TABLETS.

SPECIFICATION forming part of Letters Patent No. 606,725, dated July 5, 1898.

Application filed November 27, 1896. Serial No. 613,615. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in the Manufacture of Graphophone-Tablets, which improvements are fully set forth in the following specification.

This invention relates to the manufacture of tablets or blanks adapted to receive engraved records of sounds, and more particularly to the composition of matter of which the tablet is composed.

The recording material in order to answer well the requirements of the engraving method of recording sounds should be perfectly amorphous, slightly cohesive, and capable of being removed cleanly and smoothly in chips or shavings under the action of the recording-stylus when actuated by the feeble force of sound-waves. The material, moreover, should be sufficiently hard to withstand ordinary handling, to retain perfectly its form, and to resist the effect of ordinary changes of temperature. It should also be a stable compound or material in order that records made in it may be preserved for indefinite lengths of time.

As pointed out in Letters Patent No. 341,214, granted May 4, 1886, to C. A. Bell and S. Tainter, the properties above indicated reside in a greater or less degree in wax and wax-like substances—such as beeswax, paraffin, stearin, &c.—though by special preparation of these and similar substances their fitness for the purpose in view has been increased.

It has been heretofore proposed to use as a sound-recording material an insoluble soap made by saponification of any fatty acid by means of an earthy alkali, such as lime. It has also been proposed to employ a metal, such as lead, combined with stearic or oleic acid, and particularly a mixture of oleate and stearate of lead; but tablets made of insoluble lime-soap or of stearates or oleates of lead have never yielded commercially-successful results. Several practical difficulties have been encountered in endeavoring to make tablets composed wholly or in part of soap. The chief difficulty has been that the surfaces of

such tablets become coated after a greater or less length of time with a bluish film having the appearance of mold and which has been termed “efflorescence.” This is due to the presence in the material of hygroscopic compounds, which on being attacked by moisture work out to and spread upon the surface of the tablet.

I have found that lead in any form, as well as most of the salts of other metals which might be otherwise suitable for the purpose in view, give rise to hygroscopic compounds. This is particularly true of stearates and acetates of lead. Another difficulty that arises is the formation of crystalline or crystallizable compounds in the operation of making soap. The object of introducing a metal (or metallic salt) is to prevent all tendency to crystallization, it being of the first importance to secure a composition which shall be and under all conditions remain perfectly amorphous and presenting equal resistance to cutting in every direction. All ordinary commercial soaps have this tendency to crystallization in some degree, it not being possible to introduce sufficient sodium or soda salt to prevent all crystallization.

The accompanying drawing illustrates a common form of tablet for use in receiving engraved records of sounds.

In carrying out my invention, whereby all the conditions herein pointed out as essential are secured, I take stearic acid as nearly pure as can be obtained and convert it into soda soap in the manner hereinafter explained. The composition, however, differs from ordinary soap in that it contains no oleates, I having found that the presence of even a small quantity of oleate or oleic acid is detrimental. It is also important that the tallow or other source from which the stearic acid is obtained be completely deglycerinized. Except under these conditions the result will be unsatisfactory.

In converting the stearic acid into soap I produce only a partial saponification—that is to say, instead of using the chemical equivalent in caustic alkali of the fat acid I use about forty per cent. of that quantity of alkali—

thus producing what may be called a soap of about two-fifths saponification. This is the proportion which gives the best results, but is of course variable within limits. The controlling consideration is that the greater the quantity of alkali the higher will be the melting-point of the resulting soap, and a complete saponification will produce a soap which requires to melt at a temperature which will char it. As the material is to be molded into cylindrical or other forms, it must be capable of melting at a moderate temperature, say between 250° and 330° Fahrenheit. On the other hand, if the saponification be not carried far enough the material will be too soft and will run at a lower temperature than is desired. In this soap I have incorporated aluminium, which I have found to be the metal best suited in all respects for the purpose. This may be used in the form of aluminic hydrate or in the metallic state, powdered, or in small ingots. The method of introducing the metal is, moreover, important, owing to the tendency of sodium and aluminium when combined to form crystallizable compounds. Preferably the metal is first added to the soda-lye, forming with a portion thereof aluminate of soda, (sodium-ortho-aluminate,) which readily unites with the stearic acid subsequently added. The quantity of aluminium employed is relatively very small.

In order that the invention may be fully understood, I will give two formulas which have yielded the best results obtained.

35 Formula A: Stearic acid, free from oleic acid and glycerin, four hundred and eight pounds; aluminic hydrate, seven pounds; caustic-soda lye, eighty-five pounds. To this is added, for the purpose of "tempering," 40 paraffin, ozokerite, or similar material, seventy-two pounds. The caustic soda is incorporated in water until a lye of 37.5° Baumé is obtained, and this is heated to its boiling-point, about 242° Fahrenheit. The aluminic 45 hydrate is added and is quickly taken up by the lye. The stearic acid is melted and raised to about the same temperature and the compound of lye and aluminium added slowly thereto. It will unite readily therewith. It 50 is preferred to employ about the temperature indicated, as thereby the formation of the composition proceeds gradually and without violent ebullition. The temperature may subsequently be raised to about 300° Fahrenheit and continued at that heat until the water is all expelled. The composition is now 55 completed except for the addition of a material such as paraffin, ozokerite, or ceresin to bring it to the desired degree of hardness.

60 Formula B: Stearic acid, three hundred pounds; powdered aluminium, 1.5 pounds; caustic-soda lye, 37.5° Baumé, nine pounds; sal-soda dissolved in twelve gallons of water, sixty pounds; ceresin, sixty pounds. The 65 sal-soda lye and caustic-soda lye may be united before the aluminium is added, or the

latter may be added to the caustic soda and the two liquids then united. Instead of powdered aluminium I may use ordinary ingot-aluminium with results nearly if not equally 70 as good. After the material is molded to the desired form it should be quickly cooled to ordinary temperatures.

Having thus described my invention, what I claim as new, and desire to secure by Letters 75 Patent, is—

1. The process of making a sound-recording material, by dissolving aluminium in soda-lye, and adding the solution to stearic acid, substantially as described. 80

2. The process of making a sound-recording material by melting stearic acid, free from glycerin and oleates, adding thereto soda-lye and aluminium, and heating the mass, substantially as described. 85

3. In the process of making a sound-recording material, the improvement consisting in adding to stearic acid soda-lye with which a metal such as aluminium has been united in such quantity as to produce partial saponification, and heating the mixture, substantially 90 as described.

4. The process of making a sound-recording material by treating stearic acid with soda-lye in quantity sufficient to produce about a 40 per-cent. saponification, the lye containing a metal and heating the mixture, substantially 95 as described.

5. The process of making a sound-recording material by forming a soda-lye, heating to about its boiling-point, adding a small quantity of aluminium thereto, heating pure stearic acid to about the same temperature, adding the compound of lye and aluminium and continuing the heating until the moisture 100 is expelled, substantially as described.

6. The process of making a graphophone-tablet by forming a soda-lye, heating to about its boiling-point, adding a small quantity of aluminium thereto, heating pure stearic acid to about the same temperature, adding the compound, continuing the heating until the moisture is expelled, molding into the desired shape and then quickly cooling, substantially 105 as described.

7. The process of making a sound-recording material, by partial saponification of stearic acid with soda-lye having aluminium united therewith, substantially as described. 11

8. The process of making a sound-recording material, by adding aluminic hydrate to caustic-soda lye, adding the compound to melted stearic acid, and heating the mixture, substantially as described. 12

9. The process of making a sound-recording material, by adding aluminium to soda-lye, adding the same to stearic acid, heating the mixture, and adding a softening material such as paraffin, substantially as described. 12

10. A composition of matter for a sound-recording tablet formed of pure stearic acid (free from oleic acid and glycerin) partly 13

saponified by caustic soda, and having aluminium incorporated therein, substantially as described.

11. The process of making a sound-recording material by adding aluminate of soda to stearic acid and heating the mixture, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

S. T. CAMERON,
REEVE LEWIS.

No. 607,588.

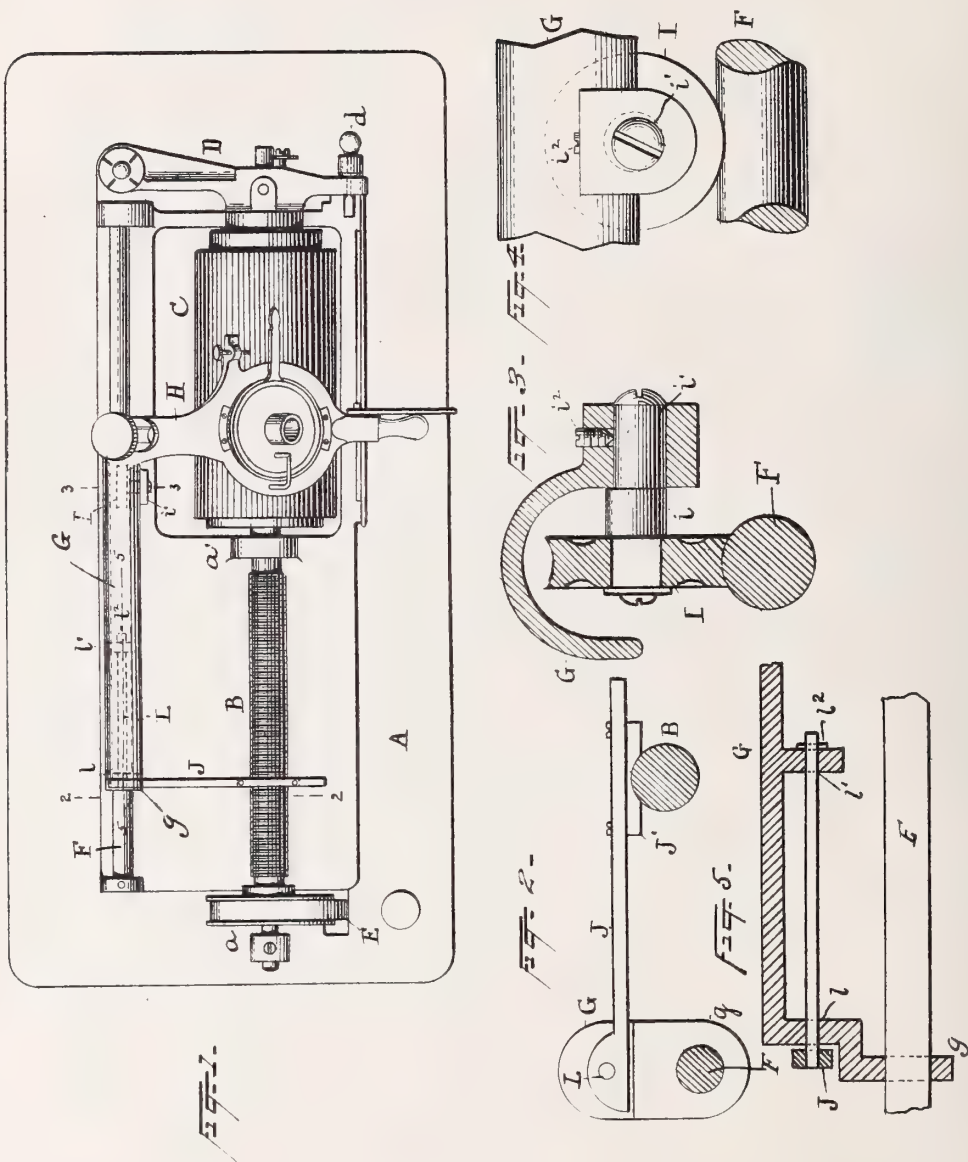
Patented July 19, 1898.

T. A. EDISON.

PHONOGRAPH.

(Application filed Jan. 27, 1897.)

(No Model.)



Witnesses
 Morris A. Clark
 W. B. H. H.

Inventor
 Thomas A. Edison
 By his Attorneys
 S. J. R. D. R. S. C.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 607,588, dated July 19, 1898.

Application filed January 27, 1897. Serial No. 620,974. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 971,) of which the following is a specification.

The object of my invention is to produce a light-running carriage for the recording and reproducing device in phonographs, and particularly for phonographs driven by a spring or weight motor.

The main feature of my invention is a device or devices for adjusting the carriage relative to the guide-rod upon which it travels. This device is preferably an adjustable roller-bearing, and in the preferred form I employ one roller, which is located as nearly as possible at the center of gravity of the carriage, so that it will be practically balanced. In practice the carriage is provided with a sleeve or collar at each end, through which the guide-rod passes freely, and by means of the adjusting device the carriage can be balanced to prevent cramping at the sleeves. By employing a roller for the adjusting device the freedom of movement is greatly increased. The roller may be provided with any suitable device for adjusting it relative to the carriage and guide-rod, but I prefer the simple arrangement illustrated. In that arrangement the roller is loosely mounted upon a pin which is inserted in a socket on the carriage and whose bearing in the socket is eccentric to the bearing of the roller, so that by turning the pin the carriage may be raised or lowered, as desired. While I have referred to one roller as the "adjusting" device, it may be stated that two or more rollers may be employed; but I prefer a single roller, since the adjustment may be more readily obtained.

Another feature of my invention is the feed-arm of the carriage, which engages with the feed-screw. This arm is pivoted to the carriage by a wide double bearing to reduce lateral motion and hence prevent cramping. The feed-arm is preferably a light gravity-arm carrying a small nut-section for engaging the feed-screw. The arm is made as light as possible to reduce the friction upon the screw.

In the accompanying drawings, which illustrate my invention, Figure 1 is a plan view of a phonograph embodying my invention, the motor being omitted. Fig. 2 is a section on the line 2 2 of Fig. 1. Fig. 3 is a section on the line 3 3 of Fig. 1, but on a much larger scale. Fig. 4 is an enlarged view of the adjusting device for the carriage, looking from the front of the machine; and Fig. 5 is a longitudinal vertical section of part of the carriage, showing the bearings for the feed-arm.

Referring to the drawings, A is the base of the machine, having the usual bearings *a a'* for the feed-screw B. At the right-hand end of the feed-screw is the phonogram-cylinder carrying the phonogram-blank C, the free end of the cylinder being centered by a centering-pin in the swinging arm D, which arm is provided with a locking device *d*. The feed-screw B is provided with a pulley, which is driven by a belt E, passing through openings in the bed-plate to the driving-motor. Behind the feed-screw and parallel therewith is the guide-rod F, upon which is sleeved a carriage G by means of two sleeves or collars *g*, which move freely on the rod. The carriage has an arm H projecting over the phonogram-blank or phonogram and rests on the front guide-bar, as shown. This arm carries the recording or reproducing device, as is well understood. The carriage G is provided with an adjustable roller I, which travels on the upper side of the guide-rod F and is located at the center of gravity of the carriage, so as to evenly support and practically balance the carriage. The adjustment of the roller is obtained by an eccentric-pin *i*, (see Figs. 3 and 4,) upon which the roller is free to rotate. The roller is placed concentrically on the pin *i*, and the outer end of the pin, as shown in Figs. 3 and 4, is turned off, (see dotted lines in Fig. 4,) so that that end of the pin will have a different center from that of the roller, and this end of the pin is inserted in a socket *i'* on the carriage G. By turning the pin with a suitable tool, such as a screw-driver, the carriage can be raised or lowered by reason of the bearing of the pin in the socket *i'* being eccentric to the center of the roller. Thus by this arrangement a very delicate adjustment of the carriage can be obtained to prevent the carriage from binding on the guide-rod. A set-

screw i^2 is provided to lock the pin i in position when adjusted.

The carriage G is fed forward by means of the feed-arm J, having the nut-section J' engaging with the feed-screw B. The feed-arm is pivoted to the carriage by a long rod L, which has a bearing in the carriage at two points l and l' , a pin l^2 being inserted in the end of the rod L to prevent its removal from the bearings. The wide double bearing provided for the feed-arm by the rod L reduces the lateral motion of the arm relative to the feed-screw and carriage. The feed-arm is quite light and rests on the feed-screw by gravity only, thereby reducing the friction on the screw.

What I claim is—

1. In a phonograph, the combination with a recorder or reproducer, a mandrel for carrying the blank, and a feed-screw, of a carriage for the recorder or reproducer, a guide-rod to which the carriage is sleeved, a friction-roller supporting the carriage at its center of gravity, and a feed-arm pivoted to the carriage and engaging the feed-screw, whereby said feed-arm does not affect the balance of said carriage on the friction-roller, substantially as set forth.

2. In a phonograph, the combination with the recorder or reproducer, of a carriage therefor, a guide-rod and guide-bar on which said carriage travels, a roller-bearing for said carriage at its center of gravity, and means for

adjusting said roller-bearing to adjust the carriage relative to the guide-rod to reduce friction, substantially as set forth.

3. In a phonograph, the combination with the recorder or reproducer, of a carriage therefor, a guide-rod and guide-bar on which said carriage travels, a roller-bearing for said carriage at its center of gravity, and an adjustable eccentric bearing for said roller, whereby the carriage is adjusted relative to the guide-rod to reduce friction, substantially as set forth.

4. In a phonograph, the combination of a guide-rod, a recorder or reproducer carriage having collars or sleeves fitting said rod, a feed-screw, and a feed-arm adapted to engage said feed-screw, said arm being pivoted to the carriage by a rod having bearings at two distant points, substantially as set forth.

5. In a phonograph, the combination of a guide-rod, a recorder or reproducer carriage having collars or sleeves fitting said rod, a feed-screw, and a gravity feed-arm adapted to engage said feed-screw, said arm being pivoted to the carriage by a rod having bearings at two distant points, substantially as set forth.

This specification signed and witnessed this 25th day of January, 1897.

THOMAS A. EDISON.

Witnesses:

RICHARD N. DYER,
W. PELZER.

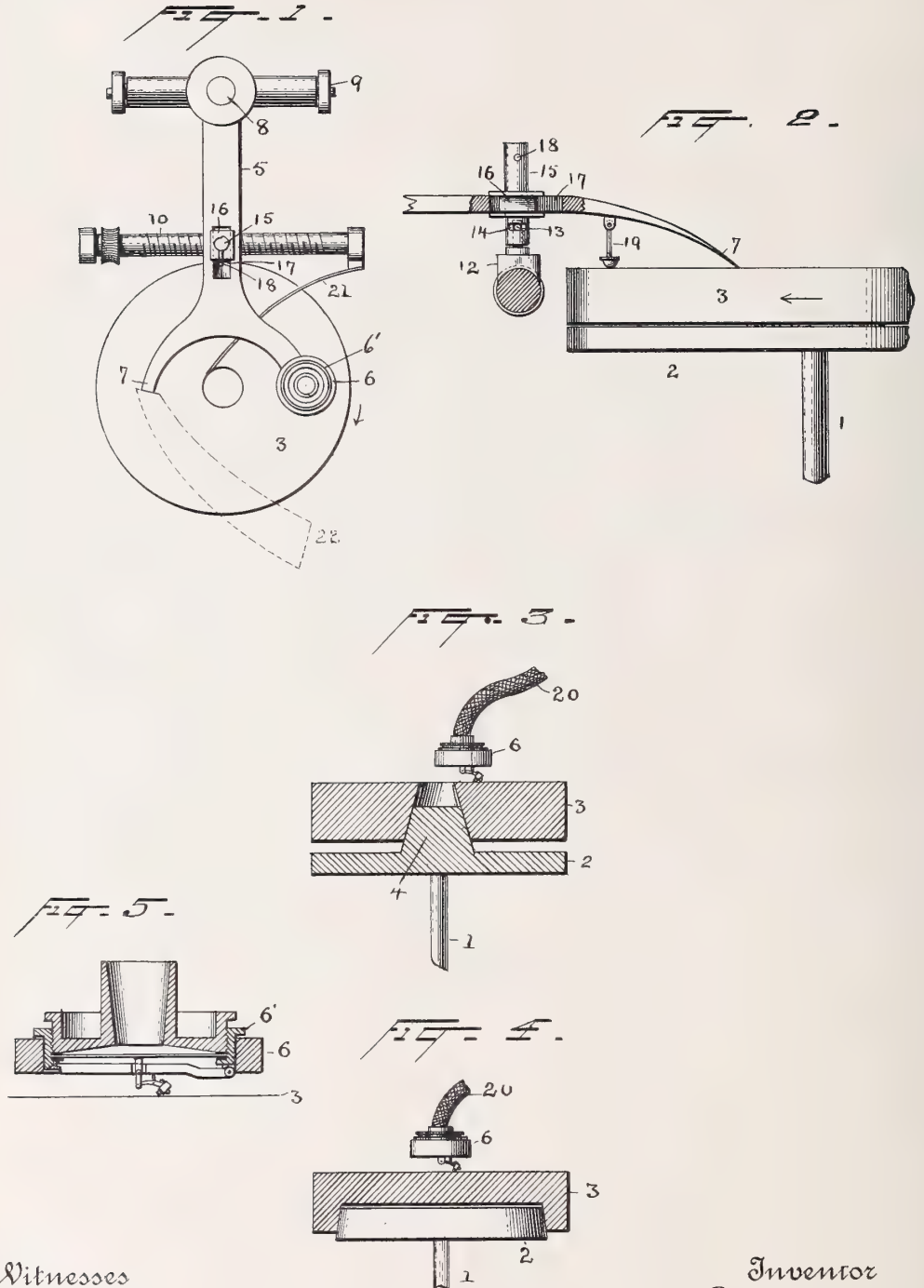
No. 609,268.

Patented Aug. 16, 1898.

T. A. EDISON.
PHONOGRAPH.

(Application filed Dec. 15, 1890.)

(No Model.)



Witnesses
Norris A. Clark
Wm. F. Oberly

Inventor
T. A. Edison
By his Attorneys
Sperdy & Seely

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 609,268, dated August 16, 1898.

Application filed December 15, 1890, Serial No. 374,759. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 883,) of which the following is a specification.

The present invention relates to phonographs in which disk phonogram-blanks or recording-surfaces are used and in which the record is formed in a spiral line on one face of the disk.

The invention consists in means for supporting the blank and connecting it to the shaft by means of which the blank is rotated.

The invention also consists in means for moving the recorder, reproducer, and turning-off tool across the blank, whereby the operating-point is caused to follow a spiral track; and the invention consists in the several features and combinations hereinafter set forth.

In the accompanying drawings, which illustrate the improvement, Figure 1 is a plan view of the phonograph. Fig. 2 is an enlarged view, partly in section, of a part of the same. Fig. 3 is a sectional view of the phonogram-blank and holder. Fig. 4 is a side view of a holder of slightly-different form, a phonogram-blank being shown in cross-section thereon; and Fig. 5 shows means for adjusting the recorder and reproducer.

The phonograph-shaft 1 is rotated at the proper speed by any suitable means. (Not shown.) At the upper end of the shaft is a holder or mandrel 2 for the phonogram-blank 3, preferably made entirely of recording material, as shown in Figs. 3 and 4. The holder, which is rigidly connected to the shaft, consists of a disk with a tapering extension 4, as shown in Fig. 3, or of a disk with inclined sides, as shown in Fig. 4. The blank is formed with a corresponding tapering recess or opening, so that it may be readily placed and centered on the holder and held in position wholly by its frictional contact with the mandrel or holder.

5 is an arm carrying the recorder and reproducer supporting ring 6 and the turning-off tool 7. The recorder and reproducer are carried by a single diaphragm, as shown in

Fig. 5, and as in my application, Serial No. 330,789, filed November 18, 1889. When the diaphragm is turned to change the points, the arm carrying said points may be tilted slightly to raise one point away from the blank. The arm 5 is pivoted at 8 to a vertical axis and at 9 to a horizontal axis, so that the arm may be moved across the blank or may be moved toward or away from the blank.

10 is a feed-screw driven by a suitable motor (not shown) which may be connected to the screw by means of a worm-gear 11 or otherwise.

12 is a nut carried by arm 5 and coöperating with the screw. This nut has a shank in the end of which is a pin 13, which rests in and moves in the slot 14 in the cam-shaped rod 15. Rod 15 is held in a block 16, which can slide back and forth in the slot 17 in arm 5.

18 is a pin or handle by means of which 15 may be turned in its socket.

19 is a "determining device" pivoted to arm 5 and having an adjustable head, as shown and as heretofore described by me.

20 is a speaking or hearing tube, and 21 is a spring or brush which rubs lightly over the surface as the blank rotates and removes the shavings and dust therefrom. A chute 22 may be carried by the turning-off tool to convey the shavings away from the blank.

The above-described apparatus is used as follows: The recorder and reproducer are adjusted away from the face of the blank and the turning-off tool is carried to the edge of the blank by moving arm 5 on its vertical pivot. The feed-screw is then rotated and moves the turning-off tool across the face of the blank and shaves off the rough surface thereof. When the tool reaches the center of the blank, arm 5 is raised and the recorder adjusted into operative position, so that it extends below the cutting edge of 7. The recorder is then carried to the center of the blank, and 12 is placed in contact with the screw, and the recorder forms a spiral record in the well-known manner. By turning the screw in the opposite direction the recorder may make its record from the edge of the blank toward its center. As arm 5 is moved by the screw the block 16 moves along in the slot 17 in view of the varying distance between the pivot and the screw and the nut 12 is

allowed to turn slightly, so that the working face of the nut shall always rest properly on the thread of the screw. When it is desired to again shave off the surface of the blank, the rod 15 is loosened freely up and down in its support, so that it can move, and the arm 5 is moved toward the blank until the determining device 19, which has been previously put in the proper position relative to the knife 7, bears on the surface of the blank. The nut then rests on the screw, and the cam-shaped rod 15 is turned slightly, causing it to bind in its socket and to be held in place. The determining device does not interfere with the working of the knife, since as the blank revolves the device is swung to one side.

What I claim is—

1. A phonogram-blank for phonographs made in the form of a thick disk adapted to be shaved off a number of times to receive new records, and provided with a central hole or depression formed perpendicular to and tapering toward the working surface, said hole or depression being adapted to fit a tapering support, whereby the blank will be centered and held in position wholly by friction, substantially as set forth.

2. A phonogram-blank for phonographs made entirely of recording material in the form of a thick disk adapted to be shaved off a number of times to receive new records and provided with a central hole or depression formed perpendicular to and tapering toward the working surface, said hole or depression being adapted to fit a tapering support, whereby the blank will be centered and held in position wholly by friction, substantially as set forth.

3. In a phonograph, the combination of a disk phonogram-blank or phonogram having a tapering opening, a tapering rotating mandrel for supporting and rotating said blank, a recording or reproducing device, support for said recording or reproducing device, pivoted so as to be capable of movement toward and away from the blank, and means for moving said arm across the face of the blank, substantially as set forth.

4. In a phonograph, the combination of a flat phonogram-blank or phonogram, a recording or reproducing device, an arm carrying said device and movable toward and away from the phonogram-blank or phonogram, and a determining device for determining the adjustment of the arm relative to the phonogram-blank or phonogram, substantially as set forth.

5. In a phonograph, the combination of a flat phonogram-blank or phonogram, a recording or reproducing device, an arm carrying said device and movable toward and away from the phonogram-blank or phonogram and across its face, and a determining device for determining the adjustment of the arm relative to the phonogram-blank or phonogram, substantially as set forth.

6. In a phonograph, the combination of a disk phonogram-blank, a holder for supporting and rotating said blank, a recording device, adapted to be moved across the face of said blank, and a tool for turning off the face of said blank, substantially as set forth.

7. In a phonograph, the combination of a disk phonogram-blank or phonogram, a rotating holder therefor, an arm carrying a recording or reproducing device, means for moving said recording or reproducing device across the face of the phonogram-blank or phonogram, a turning-off tool and a device for determining the position of said arm relative to the phonogram-blank or phonogram, substantially as set forth.

8. In a phonograph, the combination of a disk phonogram-blank, a recorder or reproducer, a support for said recorder or reproducer, pivoted so as to be capable of movement toward and away from the blank and across the face of the blank, a feed-screw, and a nut-section carried by said arm and adapted to engage said feed-screw and whereby the recording or reproducing device is caused to move across the face of the blank, substantially as set forth.

9. In a phonograph, the combination of a pivoted arm having two prongs, a recording or reproducing device carried by one prong, a turning-off tool carried by the other prong, and means for moving said arm relative to the phonogram-blank or phonogram, substantially as set forth.

10. In a phonograph adapted to receive a disk phonogram-blank or phonogram, the combination of an arm having two prongs and pivoted to move toward and away from the blank or phonogram, a recording or reproducing device carried by one prong, a turning-off tool carried by the other prong, and means for moving said arm across said phonogram-blank or phonogram, substantially as set forth.

11. In a phonograph adapted to receive a disk phonogram-blank or phonogram, the combination of an arm having two prongs and pivoted to move toward and away from the blank or phonogram, a recording or reproducing device carried by one prong, a turning-off tool carried by the other prong, a device for determining the position of said arm relative to the phonogram-blank or phonogram, and means for moving said arm across said phonogram-blank or phonogram, substantially as set forth.

12. In a phonograph, the combination with a phonogram-blank or phonogram, and a holder therefor, of a pivoted arm carrying a recording or reproducing device, a feed-screw, and an adjustable connection between said feed-screw and arm, whereby the position of the recording or reproducing device relative to the blank or phonogram may be adjusted, substantially as set forth.

13. In a phonograph, the combination with a phonogram-blank or phonogram, and a

holder therefor, of a pivoted arm carrying a recording or reproducing device, a feed-screw, an adjustable connection between said feed-screw and arm, and a device for determining the adjustment of said connection, whereby the position of the recording or reproducing device relative to the blank or phonogram may be adjusted, substantially as set forth.

14. In a phonograph, the combination with a disk phonogram-blank or phonogram, and a rotating holder therefor, of a pivoted arm carrying a recording or reproducing device, a feed-screw, and an adjustable connection between said feed-screw and arm, whereby the position of the recording or reproducing device relative to the blank or phonogram may be adjusted, substantially as set forth.

15. In a phonograph, the combination with a disk phonogram-blank or phonogram, and a rotating holder therefor, of a recording or reproducing device, a support for said device

pivoted so as to be capable of movement toward and away from and across the face of the phonogram-blank or phonogram, a feed-screw for moving said arm across the face of the phonogram-blank or phonogram, and an adjustable connection between said feed-screw and arm, whereby the position of the recording or reproducing device relative to the blank or phonogram may be adjusted, substantially as set forth.

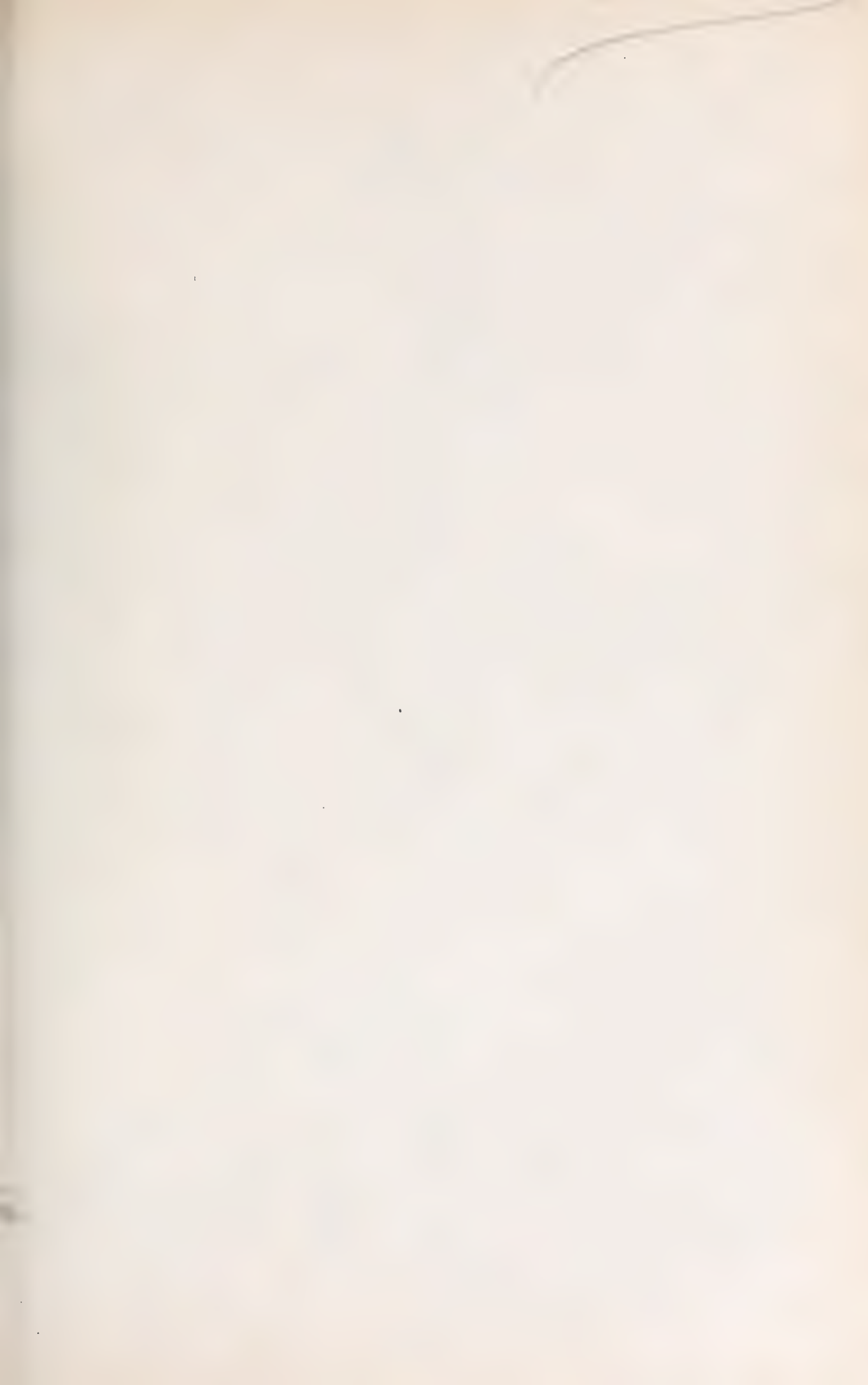
16. In a phonograph, a slotted recorder or reproducer carrying arm, a block movable in said slot, a nut-section carried by the block, and a feed-screw adapted to engage said nut-section, substantially as set forth.

This specification signed and witnessed this 6th day of December, 1890.

THOS. A. EDISON.

Witnesses:

JOHN F. RANDOLPH,
W. PELZER.



No. 609,791.

Patented Aug. 30, 1898.

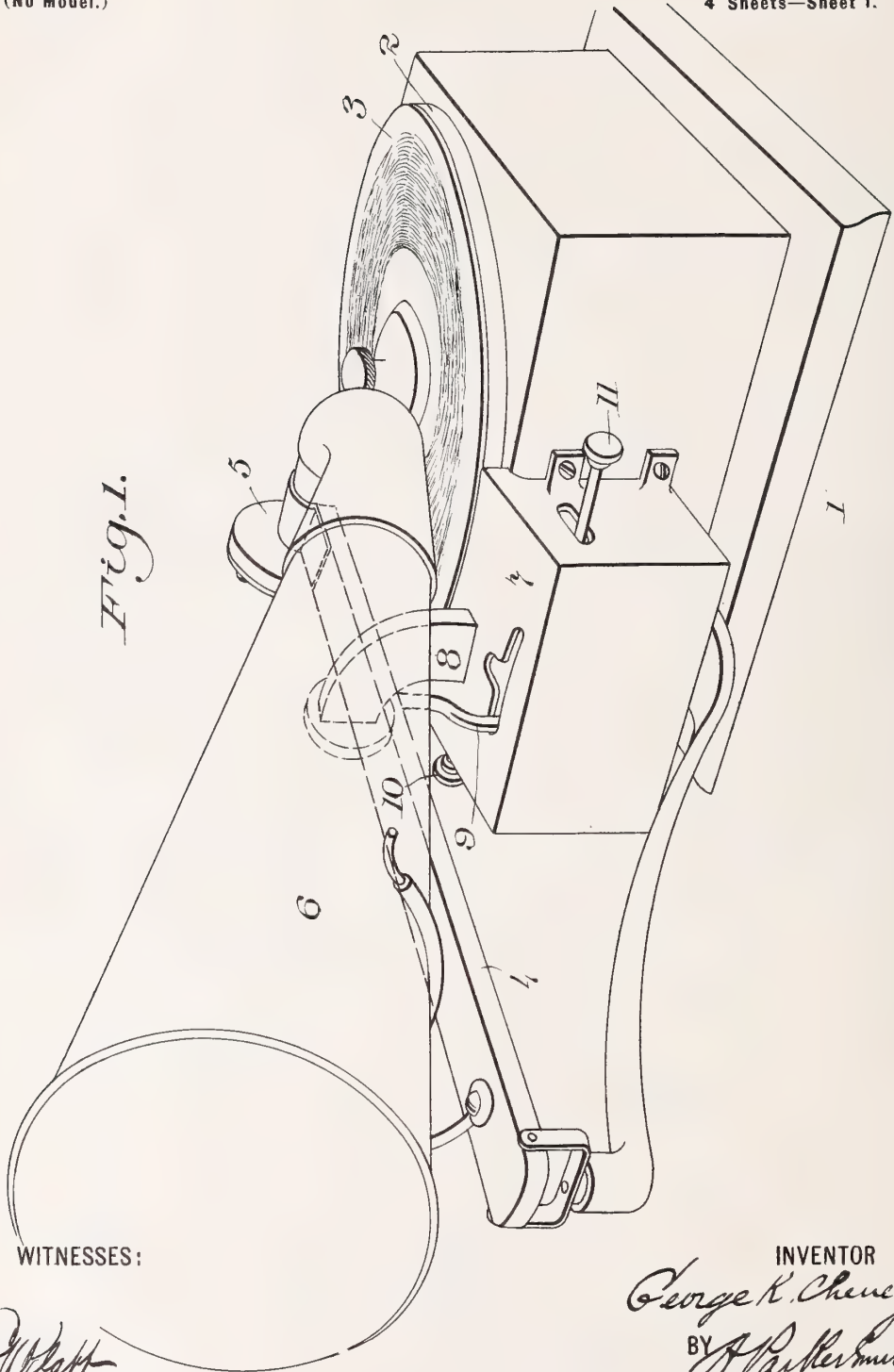
G. K. CHENEY.
COIN OPERATED DEVICE.

(Application filed Jan. 29, 1898.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

C. H. Blatt
W. H. Humphrey.

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BY *A. Parker Smith*
his ATTORNEY

No. 609,791.

Patented Aug. 30, 1898.

G. K. CHENEY.
COIN OPERATED DEVICE.

(Application filed Jan. 29, 1898.)

(No Model.)

4 Sheets—Sheet 2.

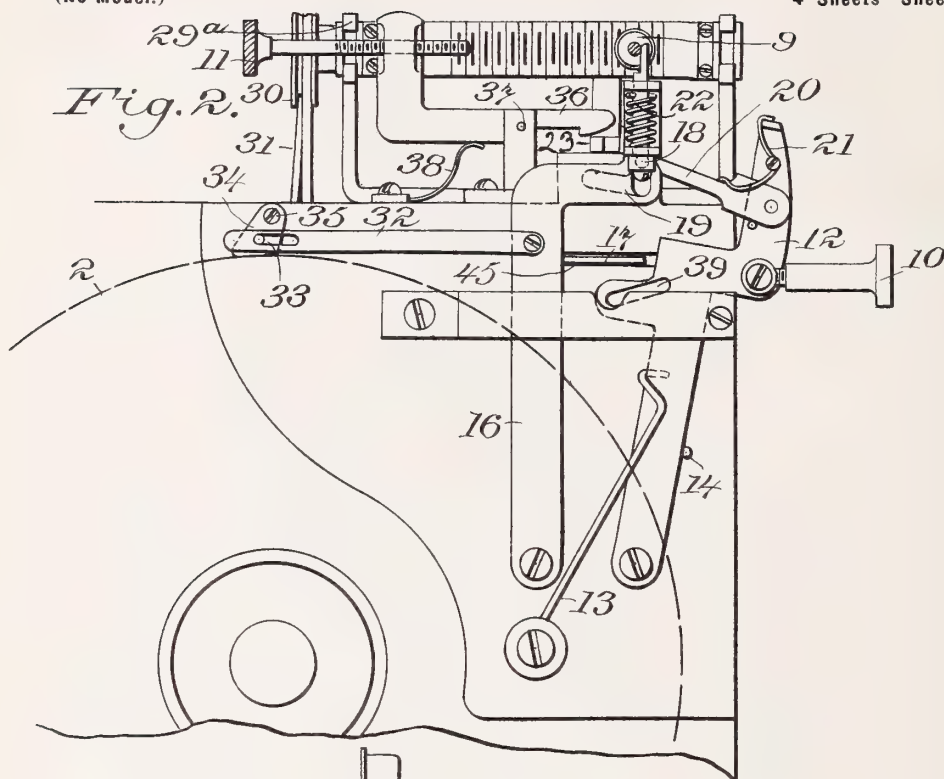
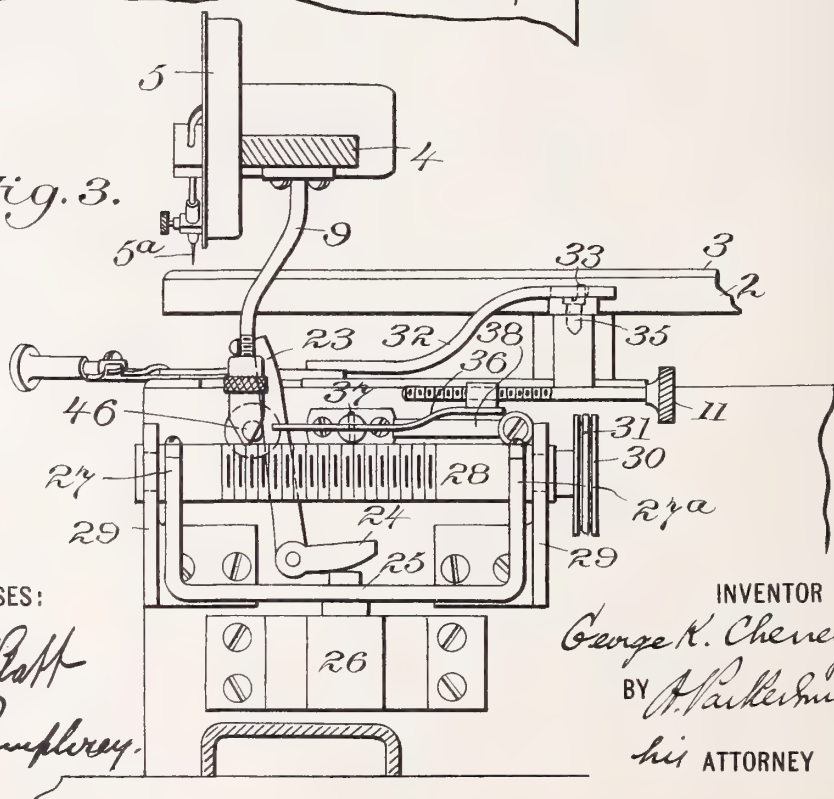


Fig. 3.



WITNESSES:

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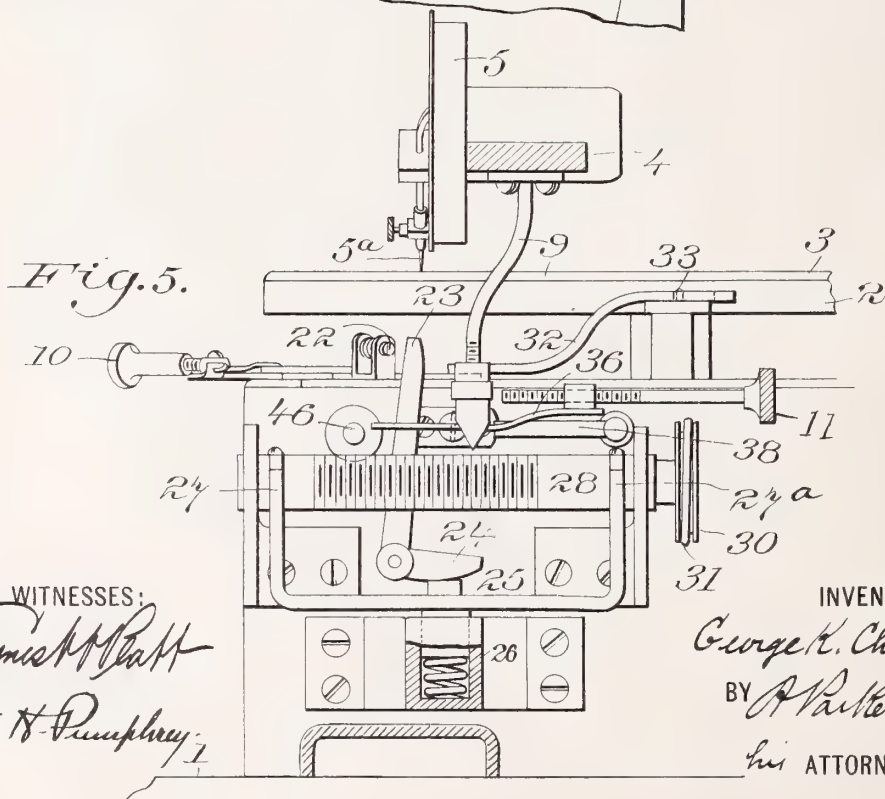
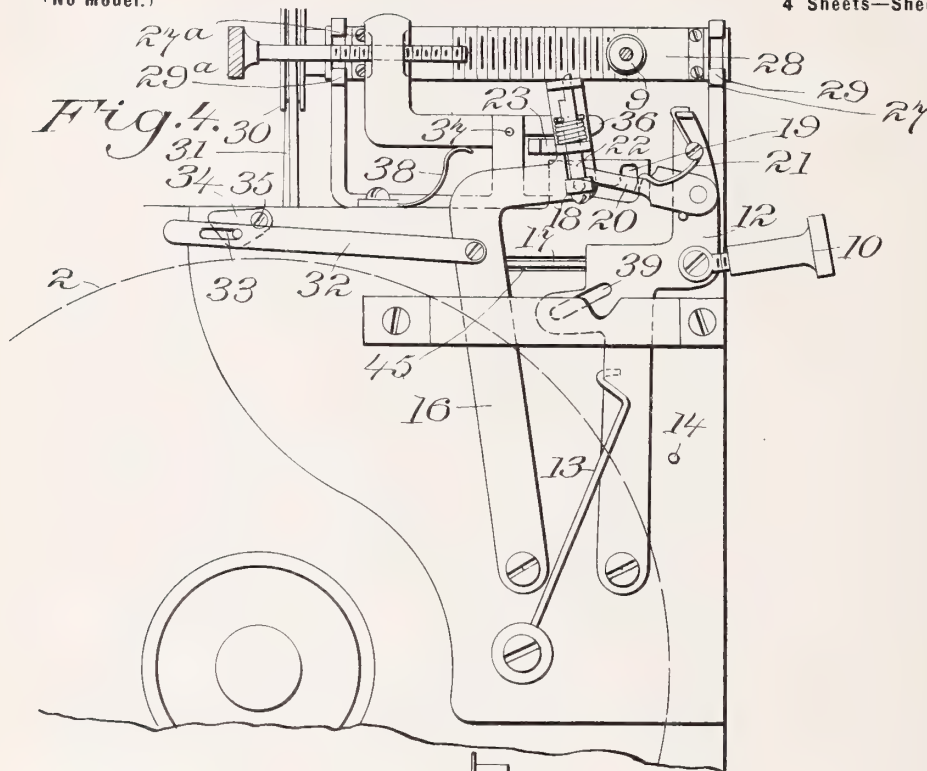
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4 Sheets—Sheet 3.



WITNESSES:

Amos M. Pratt
N. H. Humphrey

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No. 609,791.

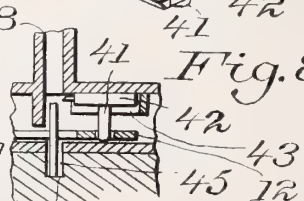
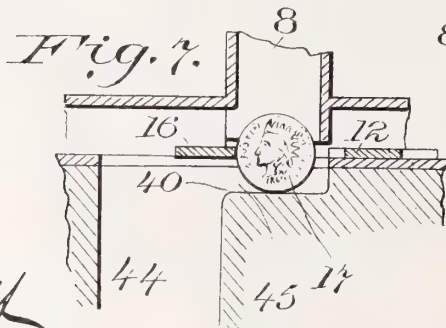
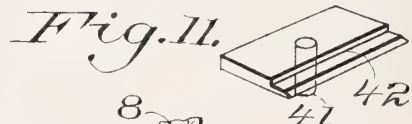
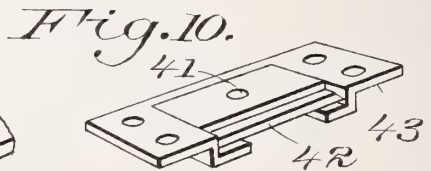
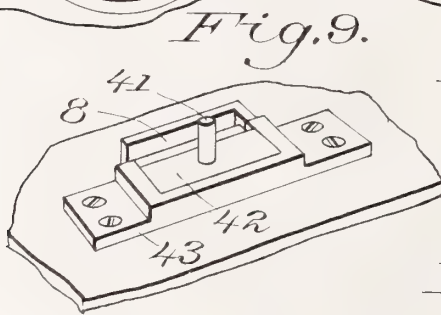
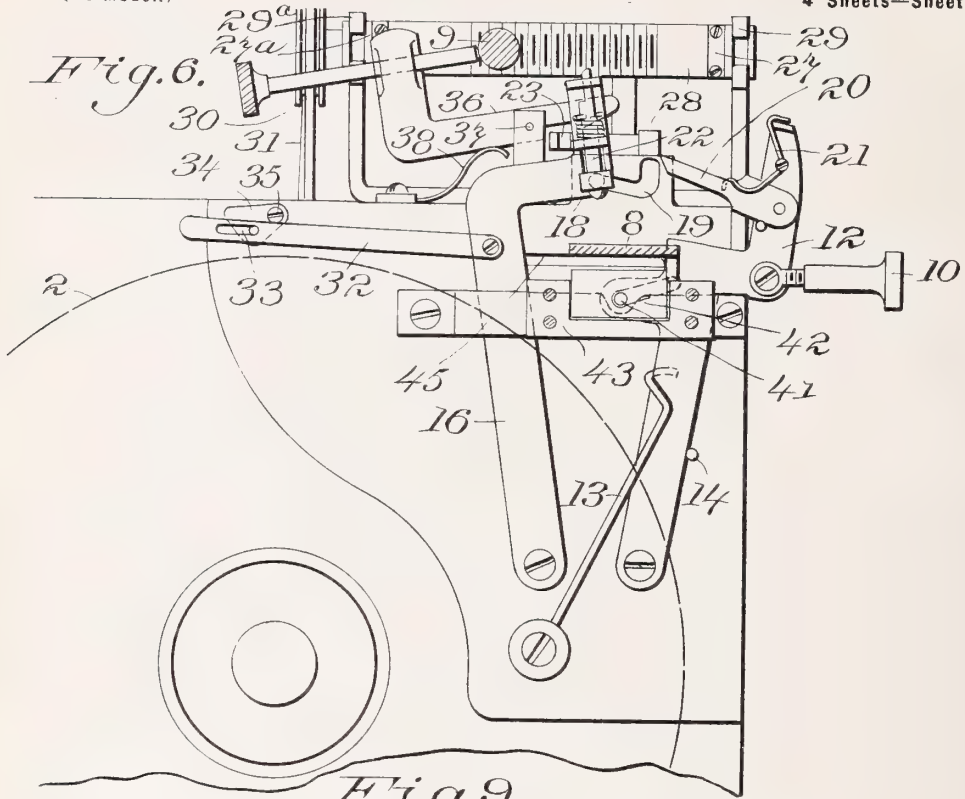
Patented Aug. 30, 1898.

G. K. CHENEY.
COIN OPERATED DEVICE.

(Application filed Jan. 29, 1898.)

(No Model.)

4 Sheets—Sheet 4.



WITNESSES:

Ernest M. Platt
W. H. Humphrey.

INVENTOR

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BY *A. P. L. Smith*
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UNITED STATES PATENT OFFICE.

GEORGE K. CHENEY, OF NEW YORK, N. Y.

COIN-OPERATED DEVICE.

SPECIFICATION forming part of Letters Patent No. 609,791, dated August 30, 1898.

Application filed January 29, 1898. Serial No. 668,384. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. CHENEY, a citizen of the United States of America, and a resident of the city, county, and State of New York, have invented certain new and useful Improvements in Coin-Operated Devices, of which the following is a specification.

My invention relates to coin-controlled mechanisms in general, but is more specifically designed to produce a coin-operated device for throwing into operation the sound-reproducing apparatus known as the "gramophone" and after the operation thereof returning the parts to the relative positions necessary for a repetition of the operation.

The preferred form of my apparatus is illustrated in the accompanying four sheets of drawings, in which—

Figure 1 is a perspective view of the gramophone with my apparatus attached. Fig. 2 is a detail plan view of the coin-operated mechanism with the coin in position ready for operation. Fig. 3 is a detail elevation of the same. Fig. 4 is a second plan view of the parts shown in Fig. 2 after the mechanism has been operated, through the agency of the coin, to start the gramophone into action. Fig. 5 is an elevation of the same part, showing the same position as Fig. 4, except that the operation of the gramophone is nearly completed. Fig. 6 is a third plan view showing the parts of the mechanism after the coin has been allowed to drop into the money-box and after the gramophone has reached the end of the particular sound-record which it has been arranged to reproduce. Fig. 7 is a detail view of the coin-chute and coin-stop. Fig. 8 is a section of the same at right angles to that shown in Fig. 7, showing the knife in position. Figs. 9, 10, and 11 are details of the knife and knife-guide.

Throughout the drawings like reference-figures refer to like parts.

1 represents the base of an ordinary gramophone, supporting a box in which is any ordinary spring or electrical motor for rotating the plate 2, which carries the sound-record 3.

4 represents the swinging arm, to which the sound-box 5 is attached and which carries the horn 6, all of the usual and well-known construction.

7 is a metal casing which incloses and pro-

TECTS my coin-controlled mechanism for operating the gramophone, and 8 is a coin-chute leading through the top of said casing.

9 is a projection from the needle-carrying arm of the gramophone down into the casing 7 to engage with the operating mechanism contained therein.

10 is a push-button by which the mechanism is set in operation through the agency of a coin introduced through the coin-chute 8, and 11 is an adjusting-screw for the tripping mechanism, hereinafter to be described, mounted in an internally-threaded lug on the rear end of the pivoted catch 36.

The needle attached to the sound-box appears in Figs. 3 and 5, (marked 5^a.)

When the mechanism is at rest, the operating parts are in the position shown in Figs. 2 and 3, the brake 34 engaging with the rotating plate 2 and preventing the rotation thereof.

A coin 17, being dropped through the coin-chute 8, strikes the coin-stop 40 (see Fig. 7) and rests between the coin-pushing lever 12 and the coin-operated lever 16. The operator then pushes on the push-button 10, which forces the coin-pushing lever 12 over against the resistance of the spring 13 and drives the coin 17 forward and through its agency pushing forward the coin-operated lever 16. At the same time the tripping-finger 20, which is shown pivoted to the coin-pushing lever and flexibly controlled by the spring 21, enters behind the locking-pin 18, which is mounted on the spring-controlled sliding bolt 22 and arranged at right angles thereto, so that it projects downwardly into the slot 19 in the bed-plate of the apparatus and normally locks the coin-operated lever 16 in the position shown in Fig. 2.

The slot 19 is formed of two portions approximately at right angles one to the other, as shown in Figs. 4 and 6. While the pin 18 remains in that portion parallel to the sliding bolt 22 no motion of the coin-operated lever 16 is possible. When the bolt 22 is slid along by the trip-finger 20 coming behind the locking-pin 18 far enough to bring the pin 18 opposite the other portion of the slot 19, which is approximately at right angles to the bolt 22, the said slot 19 no longer opposes any resistance to the swinging motion of the coin-

operated lever 16. The same motion of the locking-bolt 22 above described withdraws its other end out of engagement with the projection 9 from the swinging arm, and accordingly this source of opposition to the movement of the coin-operated lever 16 is also removed. This engagement of the locking-bolt with the projection 9 would under ordinary conditions suffice alone to lock the coin-operated lever; but inasmuch as extraordinary pressure on the push-button 10 would shove the projection 9 along the feed-screw 28 the interposition of the slot 19 and locking-pin 18 is necessary to produce a positive locking of the coin-operated lever against any force not sufficient to break the mechanism. Such locking-bolt being withdrawn by the finger 20 the coin-operated lever 16 is free to be pushed over by the coin, and after a short amount of travel strikes against and begins to move the bell-crank 23. This bell-crank 23 has a toe 24, which presses against the yoke 25, which has a vertical sliding bearing in the box 26, in which latter a spiral spring is hidden, which normally tends to hold the yoke 25 up in the position shown in Fig. 3. On the yoke 25 are the journal-bearings 27 27^a, in which is journaled the return feed-screw 28. The yoke and screw I have shown guided in the vertical guides 29 29^a.

The projection 9 from the swinging arm 4 of the gramophone rests upon the feed-screw 28, which when it is in its uppermost position, as shown in Fig. 3, lifts the needle 5^a out of engagement with the groove in the sound-record 3. The turning of the bell-crank 23 forces the yoke 25 and the feed-screw 28 carried thereby downward, so that the needle 5^a is first lowered into engagement with the groove on the sound-record 3, and then the feed-screw 28 is withdrawn from engagement with the projection 9. All this is done before the lost motion or play in the pin-and-slot connection 33 between the link 32, pivoted to the coin-operated lever 16, and the brake 34 has been taken up. This brake 34 has a pivoted mounting at 35, which may consist of the screw engaging a threaded socket in the base-plate, as indicated in Figs. 2 and 6. This screw may be turned by an ordinary screw-driver so as to bear on the brake with sufficient friction to prevent it from turning loosely during the taking up of the lost motion in the pin-and-slot connection; but after the feed-screw has been lowered out of engagement with the gramophone-arm the link 32 is moved so far that the pin-and-slot connection 33 has reached the limit of its play, and the brake is forced to one side out of engagement with the rotating plate, as shown in Fig. 4. The gramophone is then free to operate. At the same time the bell-crank lever 23 has been engaged by the spring-catch 36, pivoted at 37 and controlled by the spring 38. Accordingly on releasing the pressure from the push-button 10 the spring 13 forces

the coin-pushing lever 12 back against the stop 14, and the coin 17 (having been carried past the coin-stop 40) drops down the passage-way 44 into the money-box.

The continued rotation of the plate and sound-record carried thereby feeds the swinging arm and sound-box 5 over in the manner familiar to users of the gramophone.

When the needle has reached the end of the record, the adjustable stop 11 has been so arranged that it will come in contact with the projection 9 from the swinging arm, and the last few revolutions of the record will suffice to push the spring-catch 36 into the position shown in Fig. 6, thereby tripping the same and releasing the bell-crank lever 23. The spring concealed in the vertical bearing 26 immediately forces up the yoke 25 and return feed-screw 28 into engagement with the projection 9 from the swinging or movable arm, and as the belt 31 and pulley 30 on said feed-screw cause it to rotate simultaneously with the rotating plate 2 the feed-screw lifts the needle 5^a out of engagement with the groove in the sound-record, and the rotation of the screw slowly swings the arm 4 back to its original position.

The backward movement of the bell-crank 23 also moves the coin-operated lever 16, which is also a brake-lever, inasmuch as it is connected to and operates the brake back far enough to take up the play in the pin-and-slot connection 33 and bring the brake 34 nearly into engagement with the rotating plate. Further motion is prevented by bell-crank 23 striking stop 46. A slight further motion, however, is necessary to bring said brake into engagement, and this is supplied by the projection 9 on the swinging arm coming into contact with the projecting bolt 22 on the brake-lever at the termination of its return motion, and thereby positively bringing the brake into engagement with the rotating plate until the motion thereof, and consequently the motion of the return feed-screw, is checked. The machine is then ready for the introduction of another coin and a lowering of the needle 5^a for a repetition of the tune or recitation which has been recorded on the plate 3.

The lower end of the coin-chute 8 is removed at one side and at the back, as shown in Fig. 7. The penny is retained in its upright position by the groove 45 in the coin-stop 40. Above the coin is the knife 42, which is mounted in a horizontal guide-casing 43. (Shown in Figs. 8, 9, and 10.) This knife 42 has a projecting pin 41, which engages with the slot 39 in the coin-pusher or operating-lever 12, or is otherwise connected to said coin-pusher or operating-lever, so that the forward motion thereof will, before the coin has been pushed forward far enough to drop down the passage-way 44, cause the knife to come over into contact with the opposite side of the coin-chute and sever any string

which the customer may have tied to the coin in the hope of withdrawing the same after the machine has been set in operation.

The foregoing description of the mechanism has also set out the mode of operation. The advantages of the application of my invention to automatic feeding-machines of the gramophone type is evident in that a simple and positively-acting mechanism operates at one and the same time to throw the automatic feeding mechanism into engagement to withdraw the brake and permit the same to operate, and at the end of a predetermined and adjustable cycle of operations throws the automatic feeding mechanism out of gear, returns the parts to their original position ready for a second operation, and then sets the brake which holds them until a second coin has been introduced.

It will be seen that the coin operated or brake lever 16 is also the prime mover of the train of mechanism for disengaging the return feed mechanism. It is doubly locked against movement by an inserted wire or other means than an introduced coin by reason of the fact that not only does the locking-pin 18 engage the notch in the slot 19, but the spring-bolt 22, on which the pin is mounted, is in contact with the projection 9 of the movable gramophone-arm, which has been forced back against it by the return feed-screw 28.

It is evident, of course, that various changes could be made in the details of the mechanism herein described and illustrated without departing from the spirit and scope of my invention so long as the relative arrangement of parts shown in the drawings and the principle of operation set out in the specification are adhered to. The levers 12 and 16, for instance, might be replaced by other elements of mechanism accomplishing the same result. The various spring-catches and locking-bolts and tripping-fingers might be of different shape and differently mounted, so long as they perform the functions herein attributed to them. Other return feed mechanisms might be substituted for the screw shown, and other mountings for such feed mechanisms, which would still allow it to be withdrawn from engagement with the swinging arm during the predetermined period, might be substituted for that which I have illustrated and described; but all these I regard as variations in form and not in substance, and still within the scope of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a coin-controlled apparatus, the combination of the movable arm, an automatic feed mechanism therefor, a brake for said feed mechanism, a return feed mechanism normally in gear with the arm, and coin-actuated means for throwing both said brake and return feed mechanism out of engagement, substantially as described.

2. In a coin-controlled apparatus, the com-

bination of the movable arm, an automatic feed mechanism therefor, a brake for said feed mechanism, a return feed mechanism normally in gear with the arm, and coin-actuated means for throwing both said brake and return feed mechanism out of engagement, together with automatic means for throwing the return feed mechanism into engagement with the arm at the end of its movement, substantially as described.

3. In a coin-controlled apparatus, the combination of the movable arm, an automatic feed mechanism therefor, a brake for said feed mechanism, a return feed mechanism normally in gear with the arm, and coin-actuated means for throwing both said brake and return feed mechanism out of engagement, together with automatic means for throwing the return feed mechanism into engagement with the arm at the end of the movement, and means for forcing the brake into engagement at the end of the return movement of the arm, substantially as described.

4. In a coin-controlled apparatus the combination of the movable arm, an automatic feed mechanism therefor, a return feed-screw, connections whereby said return feed-screw is rotated by the automatic feed mechanism, coin-controlled means for raising and lowering said screw, and a projection from the movable arm which engages with said return feed-screw, when the latter is in its uppermost position, substantially as described.

5. In a coin-controlled apparatus the combination of the movable arm, an automatic feed mechanism therefor, a return feed-screw, connections whereby said return feed-screw is rotated by the automatic feed mechanism, coin-controlled means for raising and lowering said screw, and a projection from the movable arm which engages with said return feed-screw, when the latter is in its uppermost position, together with a brake for the automatic feed mechanism and connections whereby the coin-controlled mechanism releases the brake when it lowers the return feed-screw out of engagement with the projection on the movable arm, substantially as described.

6. In a coin-controlled apparatus, the combination of the brake, the lever which controls the same, the lock on said lever, the operating-lever so placed as to push the brake-lever through the agency of an interposed coin, and a projection on said operating-lever disposed to trip the lock on the brake-lever, substantially as described.

7. In a coin-controlled apparatus, the combination of the brake, the lever which controls the same, the lock on said lever, the operating-lever so placed as to push the brake-lever through the agency of an interposed coin, and a projection on said operating-lever disposed to trip the lock on the brake-lever, together with automatic means for forcing back said brake-lever and throwing the

brake into engagement again at the end of a predetermined cycle of operations, substantially as described.

8. In a coin-controlled apparatus the combination of the movable arm, an automatic feed mechanism therefor, a return feed-screw, movable bearings therefor, connections whereby said return feed-screw is rotated by the automatic feed mechanism, a projection from the movable arm adapted to engage with the feed-screw, a spring which normally holds said return-feed-screw bearings in their uppermost position, and coin-controlled means for lowering said bearings so that the return feed-screw will not engage the projection from the movable arm during a predetermined period of time, substantially as described.

9. In a coin-controlled apparatus the combination of the movable arm, an automatic feed mechanism therefor, a return feed-screw, movable bearings therefor, connections whereby said return feed-screw is rotated by the automatic feed mechanism, a projection from the movable arm adapted to engage with the feed-screw, a spring which normally holds said return-feed-screw bearings in their uppermost position, and coin-controlled means for lowering said bearings so that the return feed-screw will not engage the projection from the movable arm during a predetermined period of time, together with a spring-catch for holding said screw-bearings down, and an adjustable projection on said catch, located in the path of the movable arm at the end of its forward movement, substantially as described.

10. In a coin-controlled apparatus the combination of the movable arm, an automatic feed mechanism therefor, a return feed-screw, movable bearings therefor, connections whereby said return feed-screw is rotated by the automatic feed mechanism, a projection from the movable arm adapted to engage with the feed-screw, a spring which normally holds said return-feed-screw bearings in their uppermost position, and coin-controlled means for lowering said bearings so that the return feed-screw will not engage the projection from the movable arm during a predetermined period of time, together with a spring-catch for holding said screw-bearings down, and an adjustable projection on said catch, located in the path of the movable arm at the end of its forward movement, a brake for the automatic feed mechanism, and mechanism connected therewith which extends across the path of the movable arm at the end of the return movement, substantially as described.

11. The combination with a gramophone, of a brake for the rotating plate thereof, means for normally supporting the needle out of engagement with the rotating plate, and coin-controlled means for withdrawing said supporting means, and disengaging the brake, substantially as described.

12. The combination with a gramophone, of a brake for the rotating plate thereof, means for normally supporting the needle out of engagement with the rotating plate, and coin-controlled means for withdrawing said supporting means, and disengaging the brake, together with a spring-catch for holding said supporting means withdrawn, and an adjustable projection on said spring-catch located in the path of the needle-carrying arm, substantially as described.

13. The combination with a gramophone of a brake for the rotating plate thereof, a return feed-screw normally in engagement with the needle-carrying arm and supporting the needle out of engagement with the rotating plate, mechanism whereby the motion of the rotating plate is transmitted to the return feed-screw, a coin-controlled lever for lowering said return feed-screw out of engagement with the needle-carrying arm, and releasing the brake, a spring-catch for holding said feed-screw in its lowered position, a trip for said spring-catch located in the path of the needle-supporting arm, and a projection on said coin-controlled lever located also in the path of the needle-carrying arm at the end of its return stroke, substantially as described.

14. The combination with a gramophone of a brake for the rotating plate thereof, a return feed-screw normally in engagement with the needle-carrying arm and supporting the needle out of engagement with the rotating plate, mechanism whereby the motion of the rotating plate is transmitted to the return feed-screw, a coin-controlled lever for lowering said return feed-screw, out of engagement with the needle-carrying arm, and releasing the brake, a spring-catch for holding said feed-screw in its lowered position, a trip for said spring-catch located in the path of the needle-supporting arm, and a projection on said coin-controlled lever located also in the path of the needle-carrying arm at the end of its return stroke, together with a spring-lock on said coin-controlled lever, a coin-pusher, and means whereby the forward motion of said coin-pusher trips said lock, substantially as described.

15. The combination with a gramophone of a brake for the rotating plate thereof, a coin-operated lever, a pin-and-slot connection between the two, a spring-supported return feed-screw normally in engagement with the needle-carrying arm of the gramophone, connections whereby the forward motion of the coin-operated lever lowers the feed-screw before the pin traverses the length of the slot in the brake connection, and a friction-mounting for the brake which prevents it from moving during the play of the pin-and-slot connection, substantially as described.

16. The combination with a gramophone of a brake for the rotating plate thereof, a coin-operated lever, a pin-and-slot connection between the two, a spring-supported return feed-screw normally in engagement with the

needle-carrying arm of the gramophone, connections whereby the forward motion of the coin-operated lever lowers the feed-screw before the pin traverses the length of the slot in the brake connection, and a friction-mounting for the brake which prevents it from moving during the play of the pin-and-slot connection, but allows it to move when the lost motion of the slot is taken up, together with
10 a projection on the coin-controlled lever which

is struck by the needle-carrying arm at the end of its return stroke to force on the brake, substantially as described.

Signed by me, at New York city, this 28th day of January, 1898.

GEORGE K. CHENEY.

Witnesses:

W. H. PUMPHREY,

L. H. FOSTER.

No. 610,706.

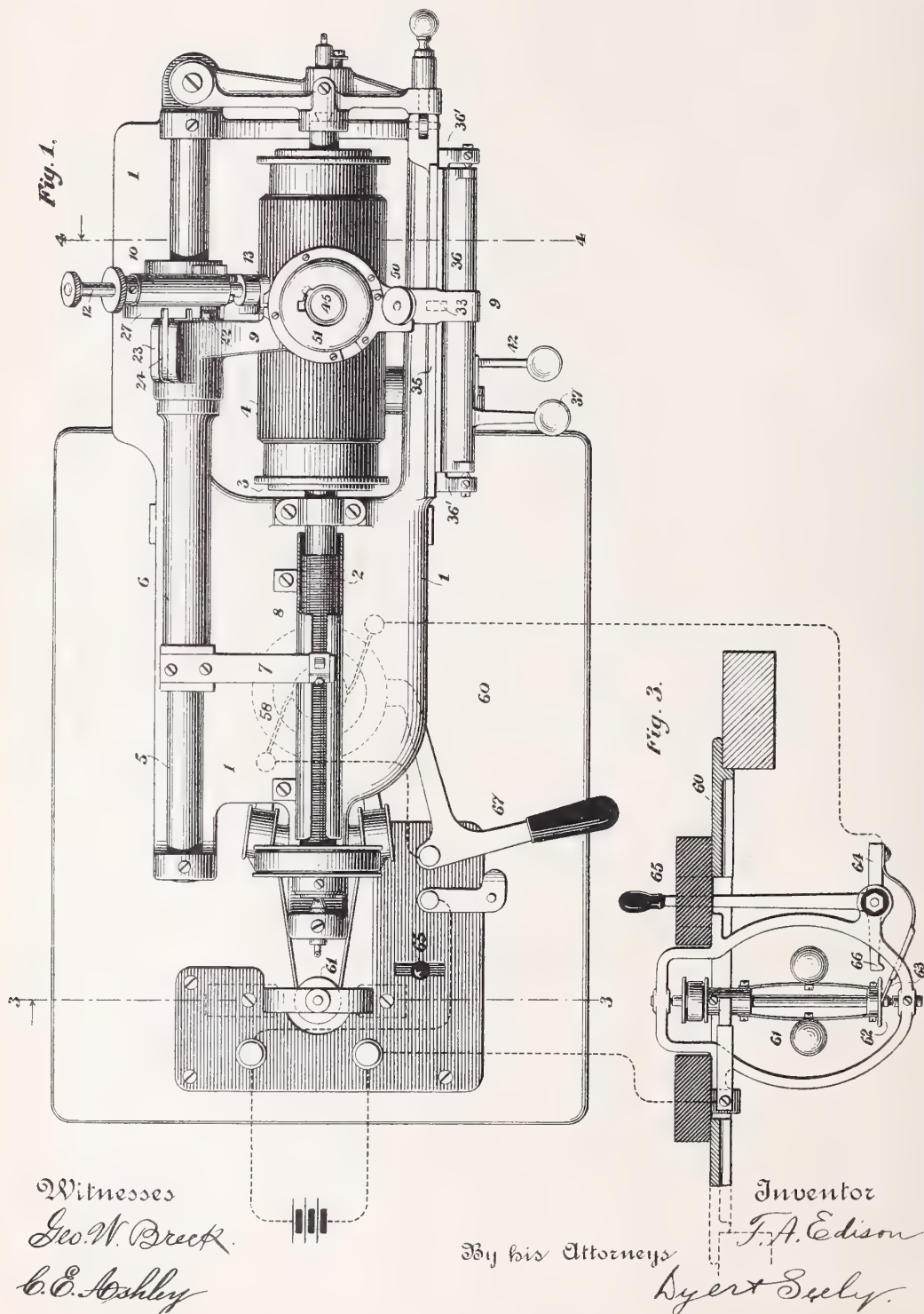
Patented Sept. 13, 1898.

T. A. EDISON.
PHONOGRAPH.

(Application filed Dec. 3, 1890. Renewed Feb. 4, 1897.)

(No Model.)

3 Sheets—Sheet 1.



No. 610,706.

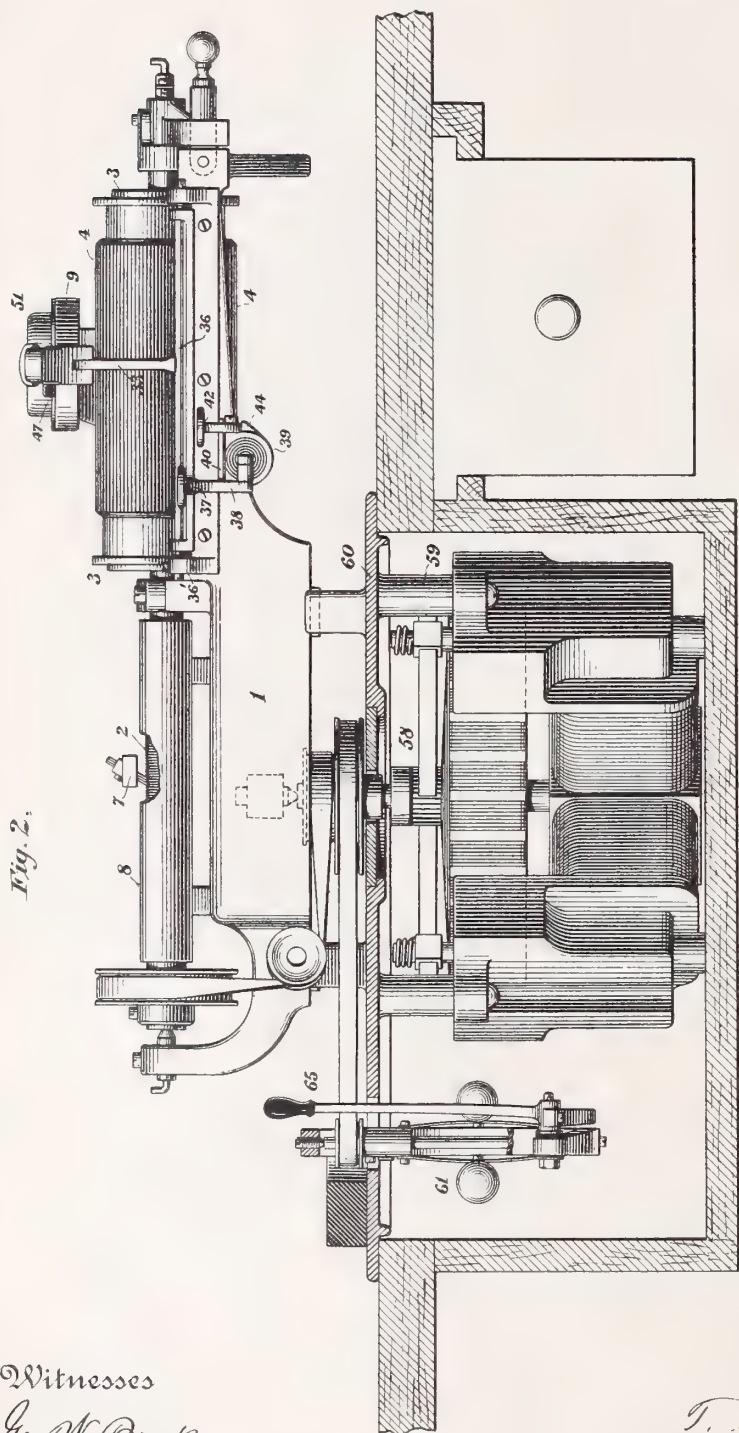
Patented Sept. 13, 1898.

T. A. EDISON.
PHONOGRAPH.

(Application filed Dec. 3, 1890. Renewed Feb. 4, 1897.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses
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Inventor
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By his Attorneys
Dyer & Seely.

No. 610,706.

Patented Sept. 13, 1898.

**T. A. EDISON.
PHONOGRAPH.**

(Application filed Dec. 3, 1890. Renewed Feb. 4, 1897.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 4.

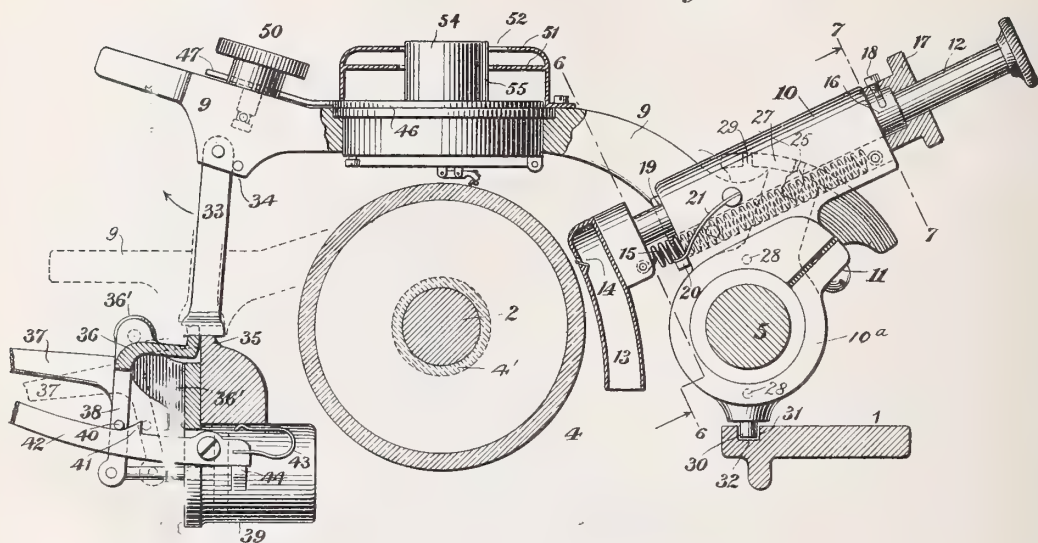


Fig. 6.

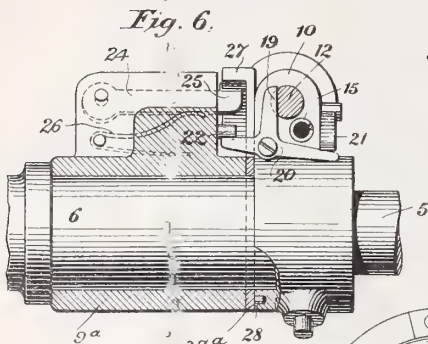


Fig. 7.

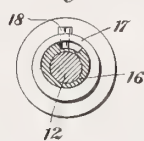


Fig. 5.

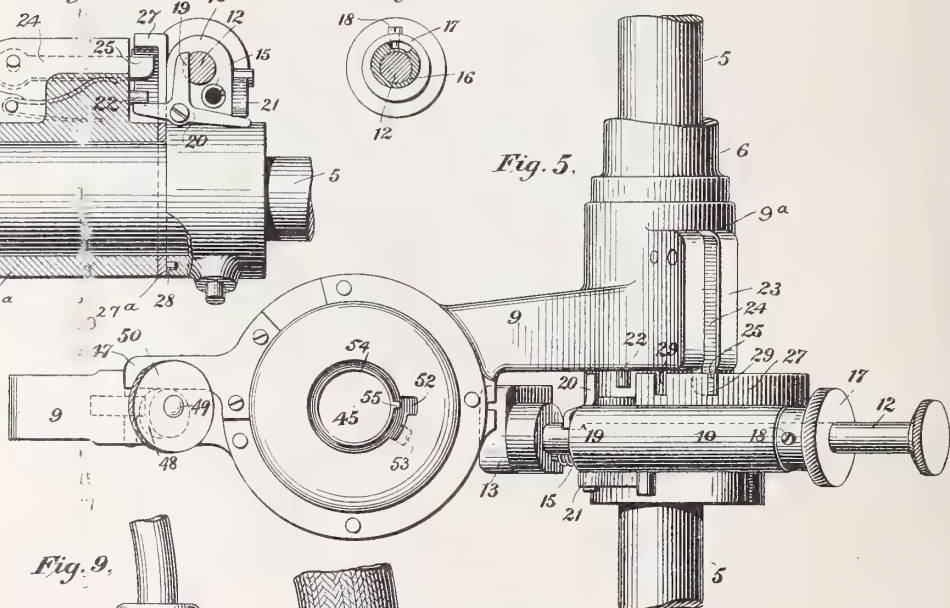


Fig. 9.

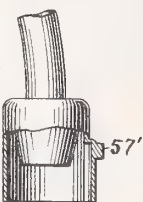
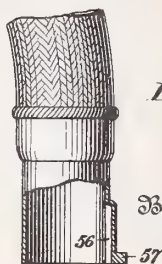


Fig. 8.



Witnesses
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By his Attorneys,
Dyer & Seely.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 610,706, dated September 13, 1898.

Application filed December 3, 1890. Renewed February 4, 1897. Serial No. 622,022. (No model.) Patented in England September 8, 1891, No. 15,206; in Belgium September 8, 1891, No. 96,313; in France September 8, 1891, No. 215,994; in Switzerland September 8, 1891, Nos. 4,348, 4,371, and 4,372; in Italy September 30, 1891, No. 30,353; in Spain October 16, 1891, No. 12,488; in Norway October 24, 1891, No. 2,527; in Austria-Hungary February 14, 1892, No. 42,615 and No. 80,937; in Cape Colony March 31, 1892, No. 752; in New South Wales April 28, 1892, No. 3,728; in Victoria April 29, 1892, No. 9,605; in South Australia May 4, 1892, No. 2,218; in Tasmania May 4, 1892, No. 1,059, and in Portugal November 23, 1892, No. 1,735.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, Case No. 900, (for which patents have been granted in the following countries: Great Britain, No. 15,206, dated September 8, 1891; Austria-Hungary, Vienna, No. 42,615, Budapesth, No. 80,937, dated February 14, 1892; Belgium, No. 96,313, dated September 8, 1891; Cape Colony, No. 752, dated March 31, 1892; France, No. 215,994, dated September 8, 1891; Italy, No. 30,353, dated September 30, 1891; New South Wales, No. 3,728, dated April 28, 1892; Norway, No. 2,527, dated October 24, 1891; Portugal, No. 1,735, dated November 23, 1892; South Australia, No. 2,218, dated May 4, 1892; Spain, No. 12,488, dated October 16, 1891; Switzerland, Nos. 4,348, 4,371, and 4,372, dated September 8, 1891; Tasmania, No. 1,059, dated May 4, 1892, and Victoria, No. 9,605, dated April 29, 1892,) of which the following is a specification.

The present invention relates to a phonograph adapted to employ phonogram-blanks of either large or small diameter; and the object of the invention is to enlarge the usefulness of the machine and to provide means for readily controlling and operating the several parts of the machine.

The invention consists in an improved recorder or reproducer carrying arm and in means for raising or lowering it.

The invention consists also in mechanism for turning off the surface of the phonogram-blanks and in means for adjusting the diaphragm to bring the recorder or reproducer into operative position for use; and the invention consists also in a holder for the speaking and hearing tubes and in certain other features and combinations hereinafter fully described and claimed.

In the accompanying drawings which illustrate the invention, Figure 1 is a plan view

of a phonograph embodying the improvements. Fig. 2 is a side view, partially in section, of the same machine. Fig. 3 is a section on line 3 3 of Fig. 1. Fig. 4 is a section on line 4 4 of Fig. 1. Fig. 5 is a plan on a large scale of the recorder and reproducer carrying arm and the turning-off tool. Fig. 6 is a section on line 6 6 of Fig. 4. Fig. 7 is a section on line 7 7 of Fig. 4. Fig. 8 shows the end of a speaking-tube adapted to be used with this instrument, and Fig. 9 is a similar view of a hearing-tube.

Upon or above the cast-iron base 1 are mounted the feed-screw 2, the phonograph-cylinder 3, a phonogram-blank 4, (which is shown on a carrier such as described in my application, Case No. 889, Serial No. 373,407, dated December 3, 1890,) and the guide-rod 5, on which the sleeve 6 is movable. At one end of said sleeve is a feed-arm 7, which has a bearing on screw 2 through a longitudinal slot in a protecting-tube 8, which is held by standards rising from the casting or base-plate 1, as shown in Figs. 1 and 2. At the opposite end of the sleeve the recorder and reproducer carrying arm 9 is supported. This arm has at its base a sleeve 9^a, which fits onto the guide-sleeve and is adapted to turn thereon. At one side of the arm is a cutting or turning off tool, which is carried by a holder 10, having a collar 10^a, which is clamped onto the guide-sleeve 6 by means of the screw 11 or otherwise. Within the holder slides a rod or handle 12, having at its lower end a chute 13 and cutting-knife 14, which is preferably of sapphire and is mounted on one edge of a slot or opening in one side of the chute, as shown. In this position it is protected from mechanical injury and serves to guide the shavings cut from the blank into the chute.

15 is a spring connected to the rod 12 and to the holder, preferably being held in a passage through the body of the holder. The spring tends to draw the knife away from the phonogram-blank. At the upper end of the holder, around the rod 12, is an extension or

sleeve 16, forming a part of or fixed to the holder. This extension is in the form of an eccentric, as most clearly shown in Fig. 7, and over this eccentric is a clamping-nut 17.

5 A screw 18, passing through one side of the nut, extends into a groove in the extension, so that although the nut can turn it is held from moving away from the holder. As the nut is turned very slightly it binds against the rod 12 and holds it in any position to which it is set. In one side of the rod or handle 12 a portion is cut away, as shown at 19, and in the notch thus formed rests one arm of a T-lever 20, pivoted as shown. A spring 21 normally holds the lever in engagement with the rod. The third arm of the lever projects into the path of a pin 22 on the recorder-carrying arm. The notch 19 is as wide as the available thickness of a phonogram-blank. This makes it impossible for a user to turn off the surface when the blank has been turned down as many times as it was intended to have it used. The upper side of the sleeve 9^a is provided with two flanges 23, between which is pivoted a lever 24, having a locking-dog 25. A spring 26 (see Fig. 6) underneath the lever 24 forces the locking-dog into notches 29 in a flange 27. This flange projects from a collar 27^a, which is fixed to the collar 10^a by pins 28. The locking-dog 25 is beveled on two sides, so that it may be readily disengaged from the notches by slight pressure on the arm 9 to adjust the position of the recording or reproducing device for recording-cylinders of different diameters or to raise the recording or reproducing device away from the blank. The locking-dog and flange 27 are provided for the purpose of locking the sleeve 9^a to the collar 10^a, so that when the arm 9 is raised or lowered by the tilting bar 36 the sleeve 6 will be turned on the guide-rod 5 and the feed-arm 7 caused to engage with or disengage from the feed-screw. To enable the locking-dog to be readily disengaged from the notches 29, the collar 10^a is provided with a pin 30, which projects into a groove 31 formed in the base-plate 1. This pin permits only a slight rotation of the sleeve 6 and collar 10^a, sufficient to engage and disengage the feed-arm from the feed-screw. The pin 30 is located so that when the presser-foot of the arm 9 rests on the guide-bar 35 it will not be in contact with the sides 31 of the groove 32, and hence will cause no friction at that point when the machine is in operation.

When it is desired to use a smaller phonogram-blank, the large blank and the phonograph-cylinders are removed and a small blank 4' placed directly on the phonograph-shaft or on a smaller cylinder. The pivoted arm 33, carried at the outer end of the recorder-carrying arm, is swung to the left, so that the foot 34 can rest on the guide-bar 35 instead of the end of arm 33, as is the case when a large blank is used. The guide-bar preferably consists of a part of the casting 1, as clearly shown in Figs. 1 and 4. The low-

ering of the arm brings the recorder and reproducer down into operative relation to the small blank, as indicated by the dotted-line position of arm 9 in Fig. 4. By exerting sufficient force on the recorder-carrying arm the tension of the spring 26 is overcome, arm 25 is forced back out of its notch, and the recorder-carrying arm turns on the sleeve 6. 25 presses against the flange 27 with sufficient force to prevent the arm falling rapidly against the blank even if the operator should accidentally release it after moving arm 33, as above explained. As arm 9 moves downward the pin 22 strikes the T-lever, moving the vertical arm out of the notch in which it rests. This makes it possible to move the cutting-tool forward far enough to shave the surface of the small blank.

The tilting bar 36 is pivoted or journaled in standards 36' beside the guide-bar and is provided with a key 37. The depression of this key tilts the bar 36 upward, as shown in dotted lines in Fig. 4, and raises the recording or reproducing point from the blank and disengages the feed-arm from the feed-screw. As the tilting bar moves to this position the arm 38 moves toward the right and operates a piston in the dash-pot 39. In the course of this movement pin 40 on the arm 38 passes over the detent 41 on the key-lever 42, and a spring 43 throws the lever 42 to its normal position and locks the key-lever 37 in its depressed position. This holds the bar 36 in its tilted position. To lower the recorder or reproducer, key-lever 42 is depressed to release the key-lever 37, when the tilting bar 36 will move slowly back to its normal position, the movement being retarded by the piston in the dash-pot, so that the recording or reproducing point will come into contact with the blank without jarring the recorder or reproducer and without injuring the blank. 44 is a projection on the dash-pot, which serves as a limiting-stop for the lever 42.

The phonograph-diaphragm 45, which carries the recorder and reproducer, is so mounted that when the diaphragm is in one position the recorder is in operative position and when moved the reproducer is brought into operative position, as shown and described in my Patent No. 465,972, dated December 29, 1891, or in any other suitable manner. The diaphragm is supported in a ring 46, carried by the arm 9. To this ring is connected a projecting arm 47, which extends by the cam 48, fixed on the shank 49 of the head 50. By turning this head in one direction the arm 47 and hence the ring and diaphragm are turned in the direction of the hands of a watch. By oppositely turning the cam and pressing against the arm 47 the diaphragm will be moved backward. This furnishes a very delicate means for adjusting the diaphragm to bring the reproducer into line with the track made by the recorder.

It is customary to employ two tubes with phonographs, one a speaking-tube for use in

recording and one a hearing-tube for use during reproduction, and the tubes are so shaped that the former cannot be put in place while the diaphragm is in position for reproducing, nor can the latter be put in place while the diaphragm is in position for recording. In the present case I show a double-topped cap 51 over the diaphragm and diaphragm-support. This cap is shown in cross-section in Fig. 4. The upper plate has an L-shaped slot, as shown in Figs. 1 and 5, and the lower plate has an opening 53 out of line with the wider portion of the first-mentioned slot. 54 is a short tube rigidly connected to the diaphragm or diaphragm-support. At one side of said tube is a rib 55, connected to the tube or to the diaphragm-support. The end of the speaking-tube which is intended to be placed next to the diaphragm is shown in Fig. 8. The inner bore of the tube is grooved, as shown at 56, or is otherwise adapted to engage with the rib 55. On the outer side of the tube is a lug 57. To put the tube in position, it is placed over 54 with the lug in line with the radial extension of the slot. The tube drops down until it reaches the lower plate of the cover. It is then turned until lug 57 comes in line with the opening 53, when it drops entirely into place, the diaphragm being brought into recording position by the same movement. To remove this tube, it is necessary to raise it to turn the diaphragm backward and then to raise the tube again. The hearing-tube can then be placed in position, the lug 57' passing through the opening in the upper plate of the cover and resting on the lower plate.

In order to shorten the machine and thus save space, the driving-motor 58 is placed directly under the phonograph-shaft instead of at one end, as heretofore. The motor is normally held in place by the posts 59, extending downward from plate 60. At the upper end of the armature-shaft is a pulley belted to the phonograph-shaft and a second pulley belted to a governor 61 in a well-known manner. The governor is adapted to break the motor-circuit when the motor reaches the limit of speed for which the governor is set. This is done by the centrifugal action of the balls raising disk 62 until it separates from the brush 63. Arm 64 can be turned by handle 65, thereby changing the position of the stop 66, and the position of said stop determines the point at which the circuit shall be broken. The motor-circuit is clearly indicated on Sheet 1, the connection passing from Fig. 1 to Fig. 3 to show the circuit through the governor. Switch 67 is shown open.

I do not claim the herein-described governor or any of the features thereof, this being claimed in a division of the present application, Patent No. 513,097, granted January 23, 1894.

Having thus described my invention, what I claim is—

1. In a phonograph, the combination of a

rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by an arm adjustable for cylinders of different diameters, and means independent of the blank for supporting said arm in different positions to positively sustain the recording or reproducing device for engagement with cylinders of different diameters, substantially as set forth.

2. In a phonograph, the combination of a shaft having a tapering mandrel adapted to receive phonogram-cylinders of small diameter, a tapering shell adapted to be placed on said mandrel to receive phonogram-cylinders of large diameter, a driving connection for rotating said shaft, and a recording or reproducing device carried by an arm adjustable for cylinders of different diameters, substantially as set forth.

3. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by an arm adjustable for cylinders of different diameters, means independent of the blank for supporting said arm in different positions to positively sustain the recording or reproducing device for engagement with cylinders of different diameters, and a feed-screw for moving said arm longitudinally of the phonogram-cylinder, substantially as set forth.

4. In a phonograph, the combination of a shaft having a tapering mandrel adapted to receive phonogram-cylinders of small diameter, a tapering shell adapted to be placed on said mandrel to receive phonogram-cylinders of large diameter, a driving connection for rotating said shaft, a recording or reproducing device carried by an arm adjustable for cylinders of different diameters, and a feed-screw for moving said arm longitudinally of the phonogram-cylinder, substantially as set forth.

5. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by an arm traveling on a guide-rod, a feed-screw for moving said arm on said guide-rod, and means for positively sustaining the recording or reproducing device for engagement with cylinders of different diameters, substantially as set forth.

6. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by an arm, a sleeve upon which said arm is adjustably mounted, whereby the same is adjustable for cylinders of different diameters, means for locking said sleeve in different positions, a guide-rod upon which said sleeve travels, and a feed-screw for moving said sleeve on the guide-rod, substantially as set forth.

7. In a phonograph, the combination of a

rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by an arm, a sleeve upon which said arm is loosely
 5 mounted, a notched flange carried by said sleeve, and a locking device carried by the arm, whereby said arm is adjustable for cylinders of different diameters, a guide-rod on which said sleeve travels, and a feed-screw
 10 for moving said sleeve on the guide-rod, substantially as set forth.

8. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by an
 15 arm, a sleeve upon which said arm is adjustably mounted, whereby the same is adjustable for cylinders of different diameters, a feed-screw for feeding the recorder or reproducer arm longitudinally of the phonogram-cylinder, a feed-arm carried by the sleeve and
 20 engaging said screw, a guide-rod upon which said sleeve travels and which sleeve is capable of partial rotation thereon to disengage the feed-arm from the feed-screw, and means
 25 for limiting the extent of rotation of the sleeve, substantially as set forth.

9. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by a
 30 pivoted arm movable longitudinally of the cylinder, a guide-rest for supporting the free end of said arm, and means for varying the distance between said arm and guide-rest to
 35 adjust the arm for cylinders of different diameters, substantially as set forth.

10. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by a
 40 pivoted arm movable longitudinally of the cylinder, a guide-rest for supporting the free end of said arm, and a pivoted presser-foot
 45 on said arm also adapted to bear upon said guide-rest, whereby the arm is adjusted for cylinders of different diameters, substantially as set forth.

11. In a phonograph, the combination of a rotating support adapted to receive phonogram-cylinders of different diameters, a recording or reproducing device carried by a
 50 pivoted arm movable longitudinally of the cylinder, a guide-rest for supporting the free end of said arm, means for varying the distance between said arm and guide-rest to adjust
 55 the arm for cylinders of different diameters, and a tilting bar for raising said arm to re-

move the recording or reproducing device from the surface of the cylinder, substantially as set forth.

12. In a phonograph, the combination with a recorder or reproducer carrying arm movable toward and away from a phonogram-cylinder, a tilting bar on which said arm rests,
 65 and which is tilted to raise said arm and remove the recording or reproducing device from the surface of the cylinder, a key-lever for operating said tilting bar, and a locking-key for holding said tilting bar in its tilted
 70 position, substantially as set forth.

13. In a phonograph, the combination with a recorder or reproducer carrying arm movable toward and away from a phonogram-cylinder, a tilting bar on which said arm rests and
 75 which is tilted to raise said arm and remove the recording or reproducing device from the surface of the cylinder, and a retarding device for retarding the downward movement of the recorder or reproducer arm, substantially
 80 as set forth.

14. A tool for turning off phonogram-cylinders, comprising a tool carried by a shank working through a support, a locking device
 85 for holding the tool when adjusted relative to the cylinder, a device for limiting the length of movement of the shank through the holder when operating on cylinders of large diameter, and means for disengaging said
 90 limiting device to permit the operation of said tool on cylinders of much smaller diameter, substantially as set forth.

15. In a phonograph, the combination of an arm movable over a phonogram, a reproducing device rotatably carried by said arm, and
 95 a cam for partially rotating said reproducing device on said arm to adjust the point of the reproducing device relative to the record, substantially as set forth.

16. In a phonograph, the combination with a diaphragm provided with a recording and a reproducing point, of a support for the diaphragm adapted to be partially rotated,
 100 means carried by said support for receiving a speaking-tube which coöperates with said means to turn the diaphragm-support and bring either the recording or reproducing point into operative position, substantially
 105 as set forth.

This specification signed and witnessed this
 110 1st day of December, 1890.

THOS. A. EDISON.

Witnesses:

JOHN F. RANDOLPH,
 W. PELZER.

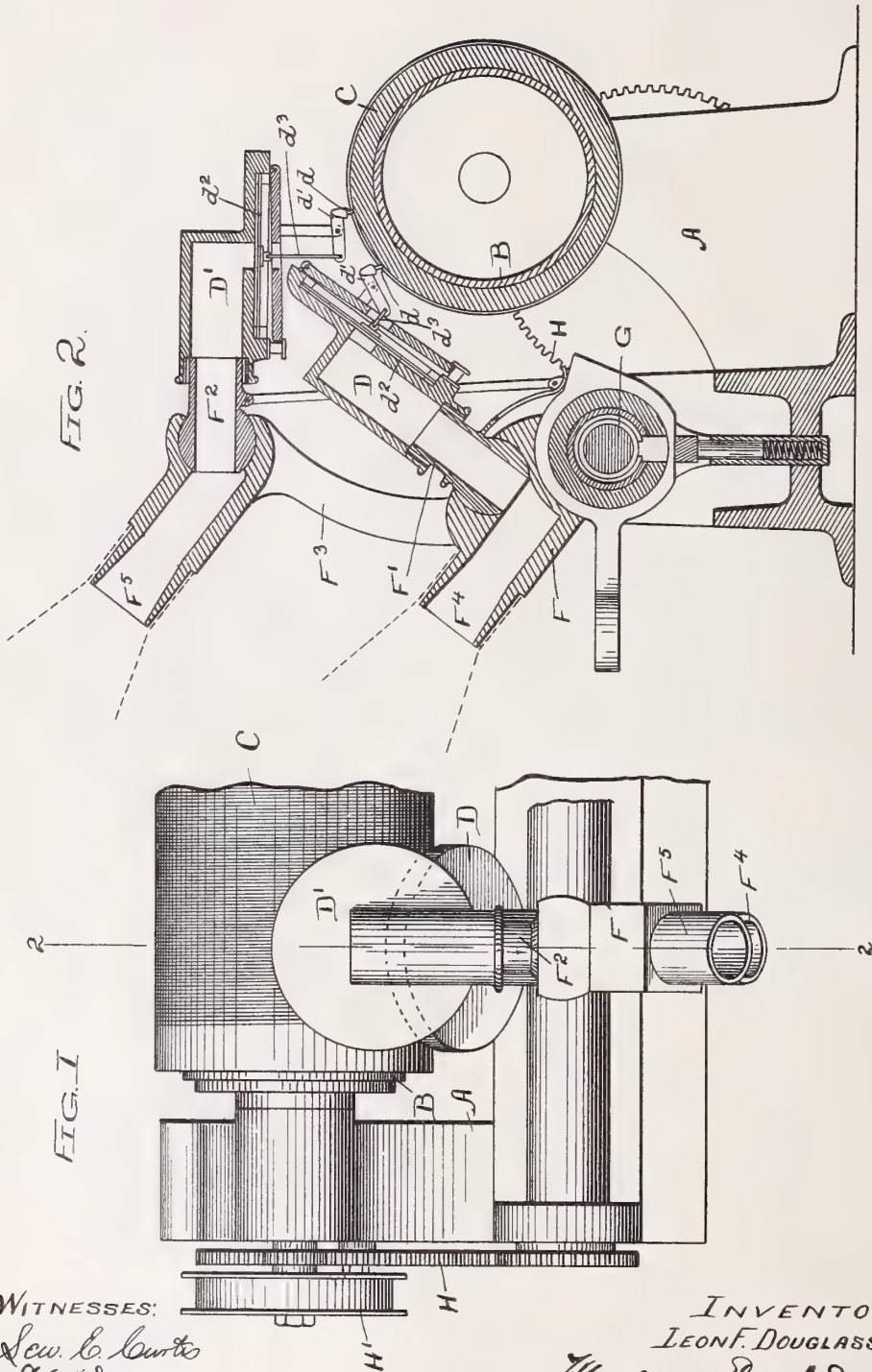
No. 613,670.

Patented Nov. 8, 1898.

L. F. DOUGLASS.
TALKING MACHINE.

(Application filed Feb. 14, 1898.)

(No Model.)



WITNESSES:

Sec. C. Curtis
A. W. Munday

INVENTOR:
LEON F. DOUGLASS

BY *Munday, Curtis & Adcock,*
HIS ATTORNEYS.

UNITED STATES PATENT OFFICE.

LEON F. DOUGLASS, OF CHICAGO, ILLINOIS, ASSIGNOR TO CHARLES
DICKINSON, OF SAME PLACE.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 613,670, dated November 8, 1898.

Application filed February 14, 1898. Serial No. 670,158. (No model.)

To all whom it may concern:

Be it known that I, LEON F. DOUGLASS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Talking-Machines, of which the following is a specification.

My invention relates to improvements in talking-machines, or machines commonly called "phonographs" or "graphophones."

The chief or principal defect in or objection to ordinary talking-machines heretofore in use is that the volume of the sound produced is comparatively small, resulting in a weak and more or less indistinct effect quite different from that of the natural voice or original music, instrumental or vocal, and the devices heretofore employed for amplifying the sounds reproduced by talking-machines, while making it louder, still further accentuate the difference between the sounds reproduced and the natural ones of the voice or of the musical instruments whose sounds have been recorded.

The object of my invention is to provide a machine of a simple and efficient construction by means of which sound-records may be reproduced with great clearness, volume, force, effect, and naturalness and so as to substantially reproduce the effect of the original when first spoken or played.

I have discovered that by combining with the rotating sound-record two or more reproducers, with the reproducing-points of the one following or tracking after the other in the same sound-record groove or thread, the important objects or results above mentioned may be accomplished.

In practicing my invention I mount two or more reproducers on the same feed slide or carriage in such position as that the reproducing-point of the one will be in the same vertical plane with the other and only a short distance behind, so that there will be only a comparatively short length of the sound-record groove between the two reproducing-points. Although I have found by my experiments that the reproducing-points, following one after the other in the same sound-record groove, may be at a considerable

distance from each other—as, for example, a quarter, a third, or more of the circumference of the ordinary sound-record cylinder—without occasioning any appreciable variation in time of the sounds reproduced by each of the reproducers, the length of the sound-record of an ordinary sound-record cylinder for a single word extends frequently two or more times around the ordinary sound-record cylinder, and it will therefore be seen that in practicing my invention the reproducing point or stylus of the one reproducer may be separated a considerable distance from the other and still cause the two reproducers to act harmoniously and to both act with substantial simultaneousness or so nearly simultaneous that the difference cannot be distinguished by the ear.

Embodying this principle and mode of operation my invention consists in the combination, with a rotating sound-record, of two or more reproducers having their reproducing-points arranged one after another and traveling in the same sound-record groove.

In the accompanying drawings, forming a part of this specification, and in which similar letters indicate like parts in both figures—

Figure 1 is a partial plan view of a talking-machine embodying my invention, and Fig. 2 is a vertical section on line 2 2 of Fig. 1.

In the drawings, A represents the frame of the machine; B, the revolving mandrel for receiving or holding the revolving sound-record C, the same being preferably of a cylindrical form, and D D' are the two reproducers, the same being each of any ordinary or suitable construction and each having a stylus or reproducing-point *d*, the one directly behind the other and separated by a short distance or space.

F is the slide or carriage, upon which the reproducers are mounted the one above the other. The lower reproducer D is mounted on the usual tubular arm F' of the slide or carriage F, and the upper reproducer D' is mounted on a similar arm F², which is carried by an arm or bracket F³, with which the reproducer slide or carriage F is provided for this purpose. The slide or carriage F is also provided with tubular arms F⁴ F⁵ for receiving

ing the customary horns or other sound-conveying devices.

G is the feed-screw, by which the slide or carriage F is moved back and forth, and H represents the gearing connecting the feed-screw with the mandrel, and H' the driving-pulley.

My invention may be applied to any ordinary graphophone or phonograph now in use by simply adding thereto the extra reproducer D' and connecting to the feed slide or carriage F in any suitable manner an upright bracket or arm F³, upon which the second reproducer is mounted, so that the same feed-slide will feed or convey both reproducers simultaneously. Each of the reproducers may be of any suitable construction known to those skilled in the art.

In the drawings I have illustrated the familiar form of reproducers now commonly used upon graphophones, the same consisting, essentially, of the stylus *d*, stylus-lever *d'*, diaphragm *d*², and connection *d*³, and a hollow shell or frame-piece upon which the parts are mounted.

I claim—

1. In a talking-machine, the combination with a rotating sound-record of two or more

reproducers, the stylus or reproducing-point of the one following that of the other in the same sound-record groove, substantially as specified. 30

2. In a talking-machine, the combination with a rotating sound-record of two reproducers arranged one above and after the other, and operating to reproduce simultaneously, substantially as specified. 35

3. In a talking-machine, the combination with a rotating sound-record of two reproducers arranged one above and after the other, and operating to reproduce simultaneously, and a feed slide or carriage provided with an arm or bracket to receive the upper-reproducer-carrying tubular arm, substantially as specified. 40

4. The combination with a feed slide or carriage having an arm F³, tubular arms F⁴, F⁵, and tubular reproducer-receiving arms F' F², and reproducers D D' mounted on said tubular arms F' F², one after another, and a sound-record mandrel and feed-screw. 45 50

LEON F. DOUGLASS.

Witnesses:

EDMUND ADCOCK,
MUNDAY, EVARTS & ADCOCK.

No. 614,168.

Patented Nov. 15, 1898.

H. J. HAGEN.
 DEVICE FOR REPRODUCING SOUND.

(Application filed Jan. 14, 1898.)

(No Model.)

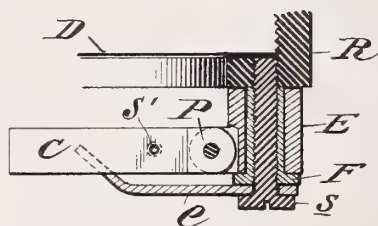
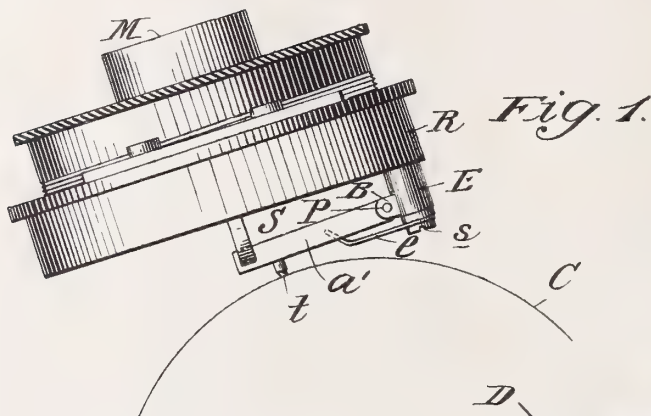


Fig. 2.

Fig. 3.

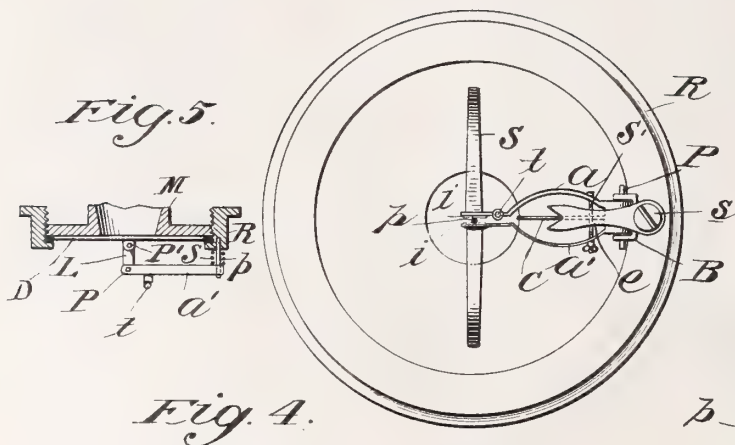


Fig. 4.

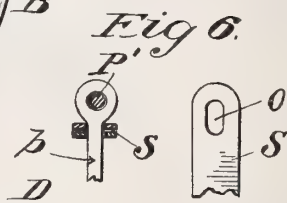


Fig. 5.

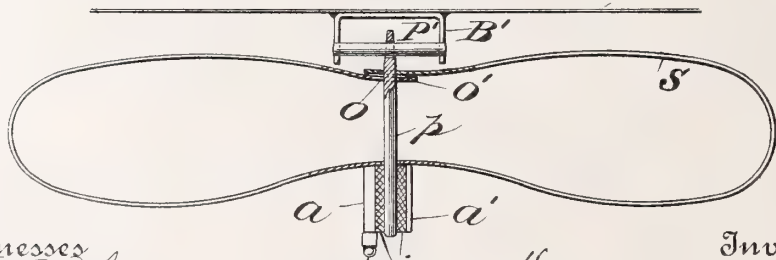


Fig. 6.

Witnesses
 Edward Bowland.
 M. M. Robinson.

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 Henry J. Hagen
 By his Attorney
 Charles J. Kintner

UNITED STATES PATENT OFFICE.

HENRY J. HAGEN, OF NEWARK, NEW JERSEY.

DEVICE FOR REPRODUCING SOUND.

SPECIFICATION forming part of Letters Patent No. 614,168, dated November 15, 1898.

Application filed January 14, 1898. Serial No. 666,589. (No model.)

To all whom it may concern:

Be it known that I, HENRY J. HAGEN, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have made a new and useful invention in Devices for Reproducing Sound, of which the following is a specification.

My invention is directed especially to improvements in what are known as "phonographic reproducing devices;" and its objects are, first, to provide means whereby the diaphragm or sound-reproducing medium may be caused to assume a relatively-fixed relation to the record to be reproduced and the reproducing-stylus so connected thereto that it will follow the inequalities of the record and faithfully yieldingly transmit them to the diaphragm under all conditions of position and usage of the instrument, and, second, to provide means whereby the stylus of such instruments will readily automatically adjust itself to the record in such manner as to cause the diaphragm or sound-reproducing medium to correctly reproduce the sounds which originally effected such record.

My invention will be fully understood by referring to the accompanying drawings, in which—

Figure 1 is a side elevational view of a well-known form of phonographic apparatus having my improvement attached thereto and illustrating also a portion of the record cylinder or blank. Fig. 2 is a plan view of the under side of the apparatus, illustrating my improvement. Fig. 3 is a detail sectional view illustrating the universal or pivotal attachment of my improvement to the diaphragm-supporting ring of the instrument, and Fig. 4 is an enlarged transverse sectional view taken through the diaphragm or sound-reproducing medium and illustrating the manner of attaching my improvement thereto. Fig. 5 is a transverse sectional view of a modified form of my improvement. Fig. 6 represents in detail view a part of the yielding connections between the diaphragm and the stylus.

With existing forms of sound-reproducing devices—such as the phonograph, graphophone, and gramophone—it is customary to cause the sound-reproducing medium, to which is attached directly the stylus, to act

by its own weight in such manner as to cause the stylus to follow the produced or indented record, so that instruments of this type are not always available in places where the downward action of the instrument may be affected—as, for instance, on board of steamers, railway-trains, or moving vehicles generally.

My improvement renders it possible to attach or secure the diaphragm-supporting ring in such manner that it (the diaphragm) will assume, once for all, a relatively permanent distance from the record as it moves thereover, while the stylus will follow correctly the record under all conditions of usage.

In the reproduction of sound from phonographic, gramophonic, and analogous records it has also been found that where the conditions between the reproducing apparatus and the record itself vary materially from those under which the record was produced there will not result a perfect or accurate reproduction of the sounds which originally produced such record. This is due to several causes, among which may be enumerated the following: First, in the use of instruments like the phonograph, wherein the record-reproducing mechanism is advanced by a screw, if the record be placed upon the recording cylinder or blank under a given condition of temperature, and if it be not reproduced under the same conditions the expansion or contraction, as the case may be, of such cylinder or blank will vary the pitch of the screw-like record to such an extent that the reproduced sounds will be materially affected; second, in instruments like the gramophone, in which the stylus is carried by a swinging arm, there is a variation in pressure between the stylus and the record at various positions of its movement as it (the arm) is caused to swing across or over the face of the record, such variations being most marked when the swinging arm is at its extreme or outer position, owing to the fact that one side of the record-line bears upon the stylus with more pressure than the other, it being a noticeable fact that when the stylus is in direct alinement with the record, so that it presses equally upon both sides thereof, the best results are attained. It was with a view of devising means for overcoming these inequalities of pressure between the record and the

usual rigidly-supported stylus of such instruments that I devised my present invention, which consists of a stylus designed for reproducing a record and so connected with the reproducing diaphragm or medium that it (the stylus) will automatically follow the record in a yielding manner and transmit its movements to the diaphragm in such manner as to give out a clear reproduction of all of the original sounds or tones which produced the record.

My invention contemplates the connecting of the stylus to the diaphragm or sound-reproducing medium in such manner that it (the stylus) will follow the record with the least possible friction and will yieldingly impart motion thereto under all conditions of usage and without utilizing gravity as an agent to that end.

Referring now to the drawings in detail for a full and clear understanding of my invention, such as will enable others skilled in the art to which it relates to manufacture and use the same, M represents the mouthpiece, D the diaphragm, and R the diaphragm-sustaining ring, of a well-known form of phonographic apparatus.

B' represents a yoke (see Fig. 4) rigidly secured to the under side of the diaphragm and having its free ends secured together by a pin P', which in instruments of the type herein illustrated is located parallel with an element of the phonogram blank or cylinder C.

p is a pin having an opening in its upper end adapted to move freely over the pin P'.

S is a spring bent in the conformation shown, its free ends being provided with oblong slots O O', through which the pin p passes. These slots O and O' are of such length as to admit of free lateral play of the pin p therethrough, as will be apparent upon inspection of Figs. 4 and 6, and said pin has its upper end flattened, as shown in Fig. 6, so as to afford a shoulder for the upper one of the free ends of the spring S.

a and a' are spring-arms secured at one end to a pivotal support consisting of a yoke B and a pin P, which yoke is in turn pivotally secured by an eye E, collar F, and screw s to the under side of the diaphragm-supporting ring R, e being a rigid arm secured also by the screw s, forked at its free end and adapted to bear firmly upon a central arm c, secured to the two arms a a'.

t is the stylus, carried by one of the arms a. i i are pieces of cork or other yielding material secured to the inner surfaces of the free ends of the arms a and a' and adapted to bear yieldingly against the lower or free end of the pin p.

S' is an adjusting-screw connecting the two arms a a' for varying the pressure between the free ends thereof and the pin p.

It will be apparent that by reason of the pivot-pin P, yoke B, eye E, and rigidly-supported collar F the two arms a and a' are

adapted to partake of universal movement and that the arm e prevents said arms from dropping below a given point and also that the spring S yieldingly connects the free ends of said arms with the diaphragm, while the pin p may partake of movement either to the right or left and the arms a and a' vertical movement with sufficient delicate frictional bearing thereon to impart correctly to the diaphragm D a reproduction of the movements of the stylus. It is apparent, therefore, that the reproducing-stylus t will correctly follow such record and with the least possible friction, at the same time correctly imparting to the diaphragm all of its movements.

In the modified form shown in Fig. 5 I have shown a reversal of the parts in which the arms a and a' are pivotally connected to the diaphragm by a link L and pivot-pins P and P', the pin p in this instance being rigidly secured to the diaphragm-supporting ring R and surrounded by a delicate compressible spring S, it being obvious that this form of the apparatus will as correctly reproduce the record as would the forms shown in Figs. 1 to 4, inclusive.

I do not limit myself to the use of such a device in connection with a sound-reproducing device, as it is obvious that the same might be applied to a sound-recording apparatus, it being only necessary in this event to apply the stylus t to the outer ends of one of the arms a a' in order to produce the best results.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a device for reproducing sound having a diaphragm, the combination of two spring-arms provided with universal connections at their opposite ends to the body of the instrument and the diaphragm respectively, and a stylus carried by one of said arms, substantially as described.

2. In a device for reproducing sound having a diaphragm, a pair of spring-arms connected by a universal joint at one end to the body of the instrument and a pin yieldingly connected with the diaphragm and the free ends of the arms, together with yielding means as a spring between the diaphragm and said arms, in combination with a stylus carried by one of said arms, substantially as described.

3. In a device for reproducing sound a diaphragm D provided with a yoke B' near its center and a pin P', a vertically-arranged pin p having movement upon the aforesaid pin, a pair of spring-arms a a' connected by a universal joint to the body of the instrument and grasping the lower end of the pin p yieldingly between their free ends, in combination with a spring S located between said arms and the yoke B' and a stylus t carried by one of said arms, all of said parts acting substantially as described.

4. In a device for reproducing sound a dia-

phragm D provided with a yoke B' near its center and a pin P', a vertically-arranged pin *p* having movement upon the aforesaid pin, a pair of spring-arms *a a'* connected by a uni-
5 versal joint to the body of the instrument and grasping the lower end of the pin *p* yieldingly between their free ends, a spring S located between said arms and the yoke B', and a stylus *t* carried by one of said arms, in combina-
10 tion with means as a screw S' for adjusting

the pressure between the free ends of the arms *a a'* and the pin *p*, substantially as described.

In testimony whereof I have hereunto subscribed my name this 12th day of January, 1898.

HENRY J. HAGEN.

Witnesses:

C. J. KINTNER,
M. M. ROBINSON.

6/8. 290

No. 618,390.

Patented Jan. 31, 1899.

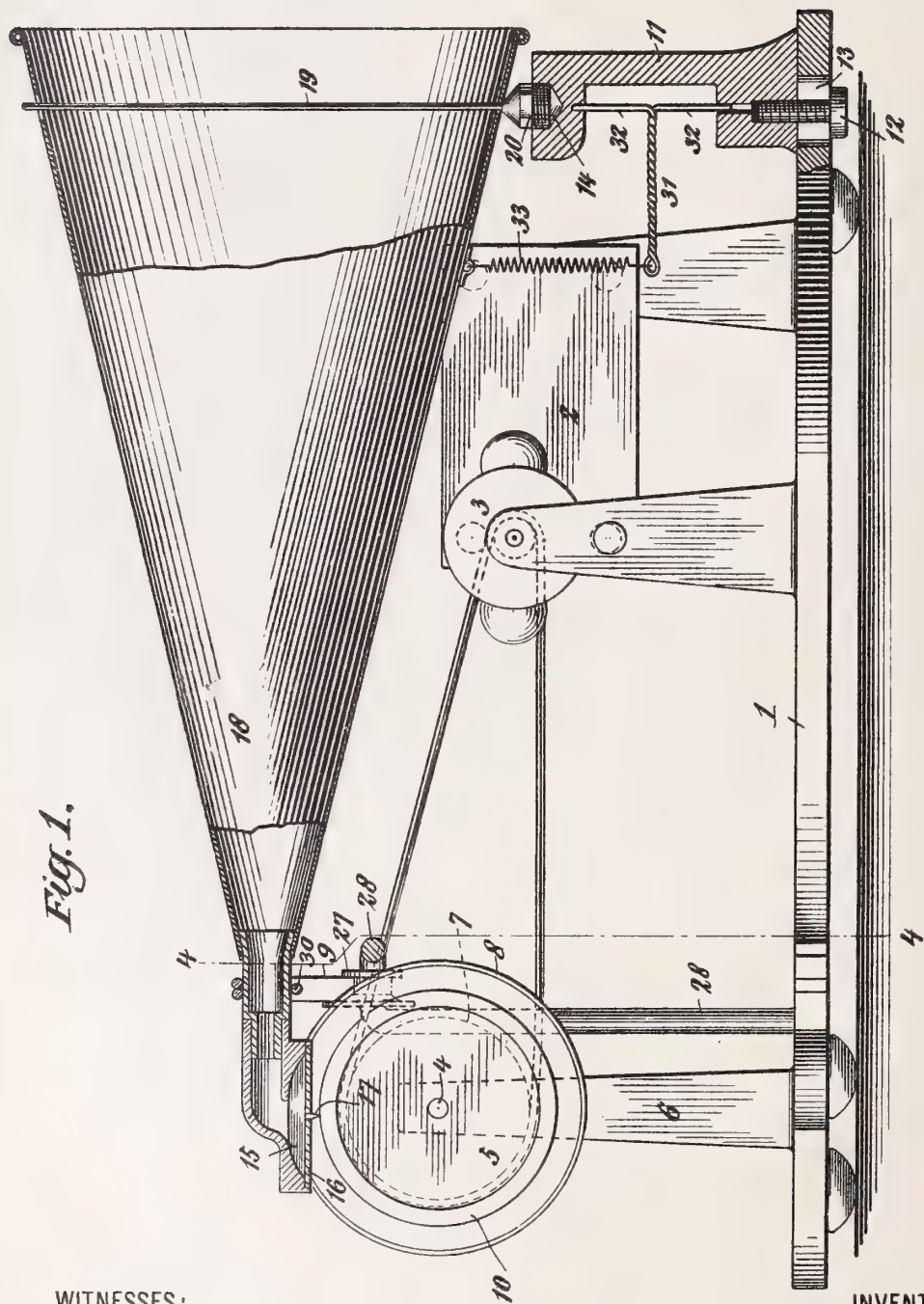
G. BETTINI.
PHONOGRAPH.

(Application filed Feb. 11, 1897.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

N. H. Hayward
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INVENTOR

Gianni Bettini

BY

E. W. Dickerson

His ATTORNEY

No. 618,390.

Patented Jan. 31, 1899.

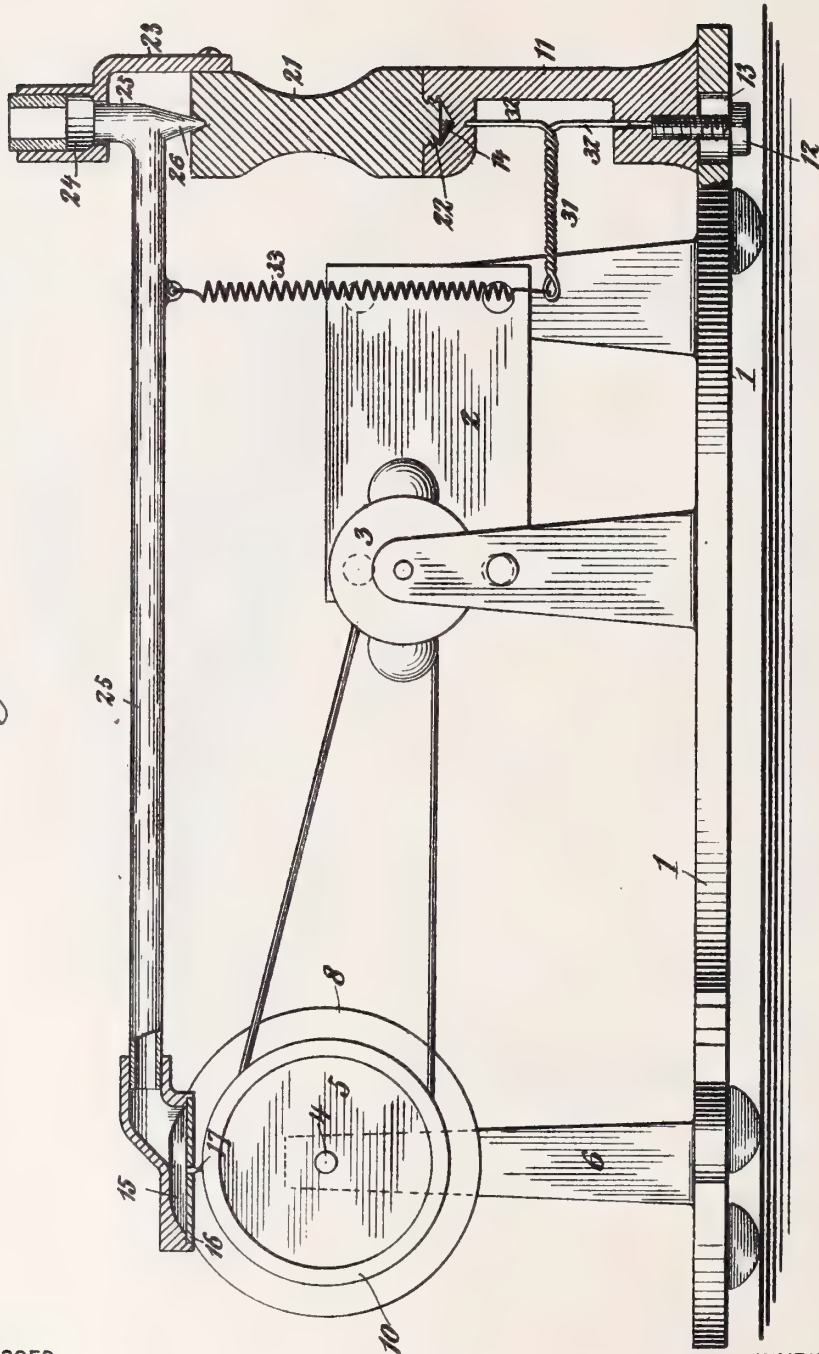
G. BETTINI.
PHONOGRAPH.

(Application filed Feb. 11, 1897.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 2,



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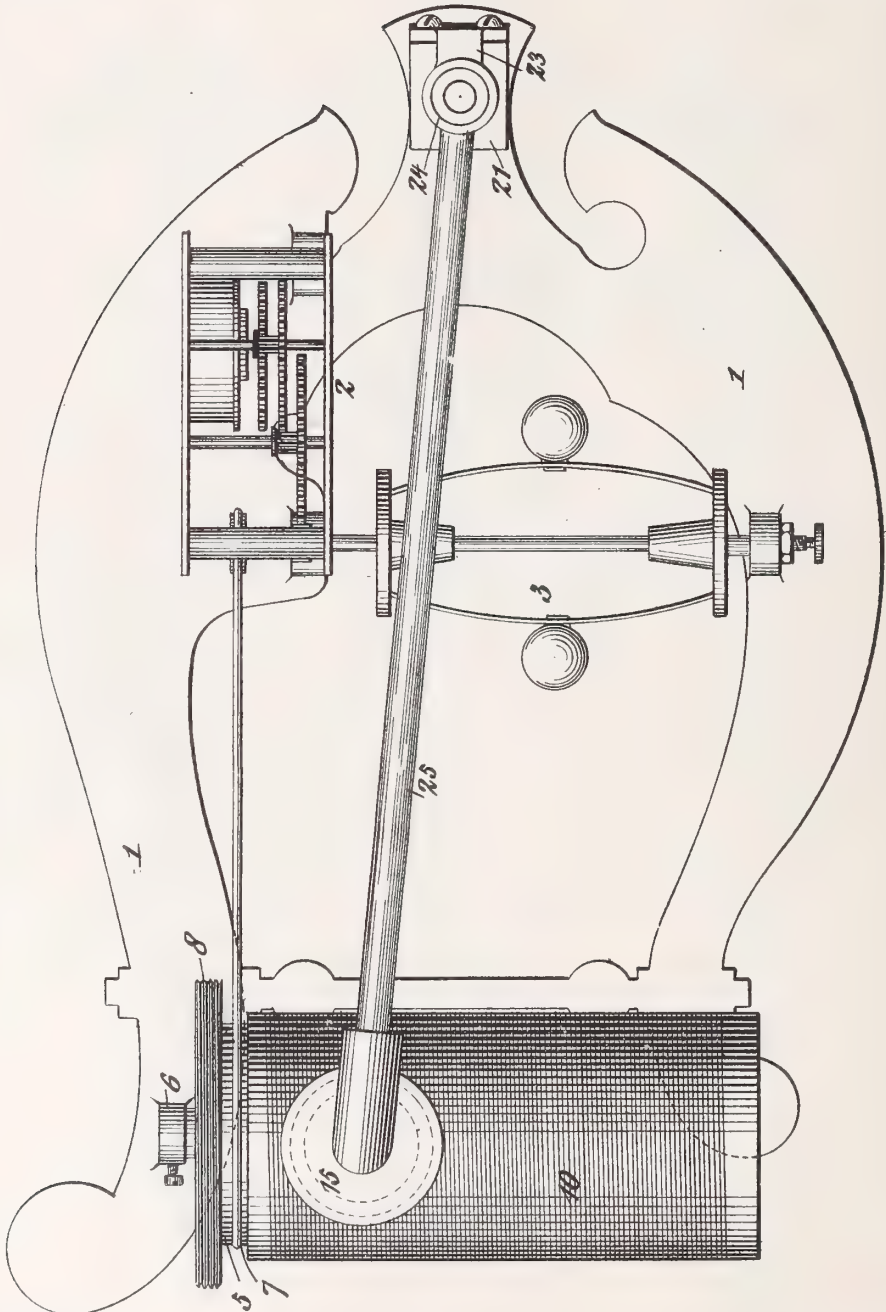
G. BETTINI.
PHONOGRAPH.

(Application filed Feb. 11, 1897.)

(No Model.)

4 Sheets—Sheet 3.

Fig. 3,



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Patented Jan. 31, 1899.

G. BETTINI.
PHONOGRAPH.

(Application filed Feb. 11, 1897.)

(No Model.)

4 Sheets—Sheet 4.

Fig. 5.

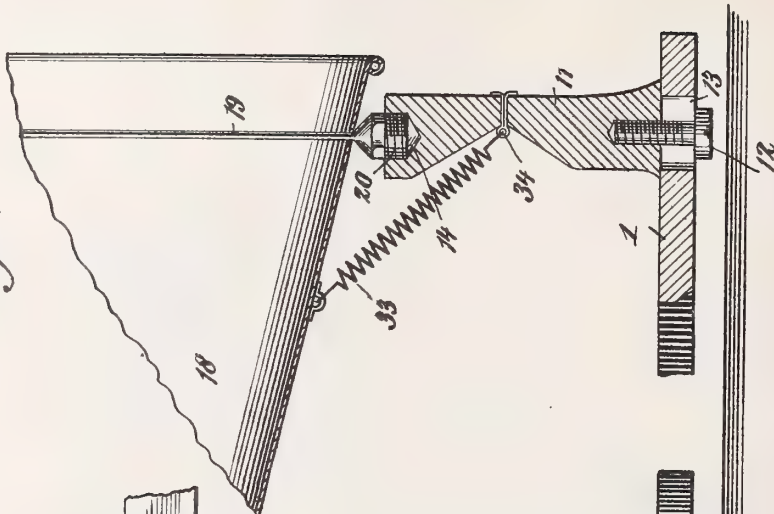
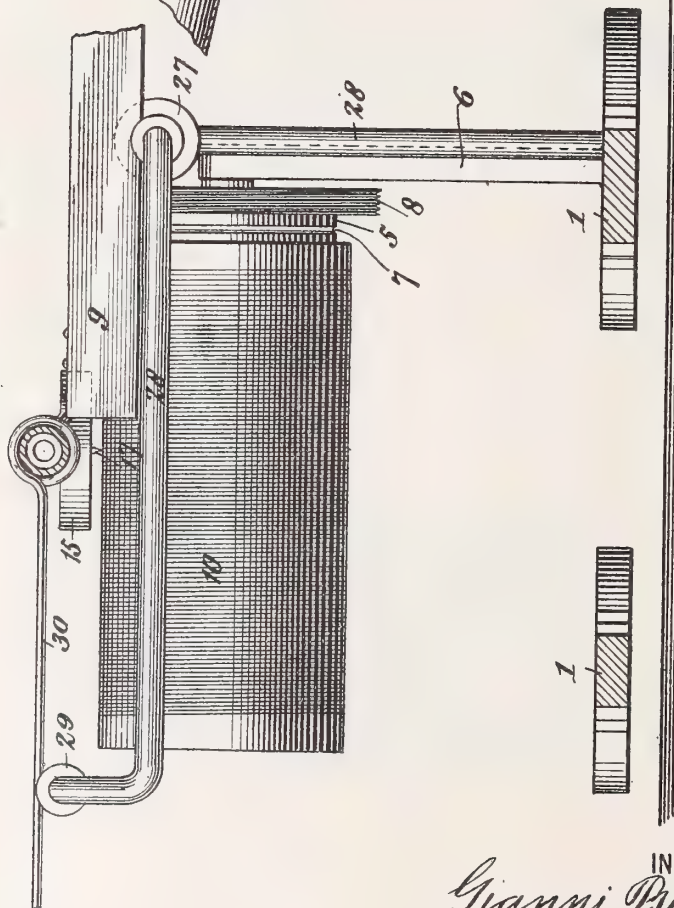


Fig. 6.



Fig. 4.



WITNESSES:

C. H. Raymond
Ernest Hopkinson

INVENTOR

Gianni Bettini

BY *E. H. Dickerson*
his ATTORNEY

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y., ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO THE LYROPHONE COMPANY, OF WEST VIRGINIA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 618,390, dated January 31, 1899.

Application filed February 11, 1897. Serial No. 622,887. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, of the city, county, and State of New York, have invented a new and useful Improvement in Phonographs, of which the following is a specification, reference being had to the drawings accompanying and forming a part thereof.

The present invention relates to new and improved apparatus for recording and reproducing sound, and has for its object to provide a construction which may be used for recording sound and reproducing the same either in the same or a magnified volume, and this by means of simple interchangeable parts capable of use in the same construction. Besides this the present invention provides a new and improved association of sound recording and reproducing parts, as the stylus-diaphragm and sound-chamber, as well as means for controlling the movement of the stylus with and yet independently of the recording-cylinder. One of the constructions of the present invention enables an immediate, exact, and loud reproduction of the vibration produced by the record to be converted into sound without any intermediate mechanism. The sound-producing diaphragm of the reproducing mechanism has supported upon it without contact with any other body the reproducing-stylus. This reproducing-stylus being directly connected to the diaphragm and, by preference, centrally located with reference to said diaphragm, conveys directly to the diaphragm the recorded sound-vibrations. The stylus follows the recorded sound-vibrations by the spiral of the cylinder itself and is therefore always exactly in register. The sound-amplifying horn connects directly with the diaphragm and is supported by the stylus, its weight being carried to the stylus through the diaphragm. The diaphragm therefore performs directly the double function of supporting the horn and of causing it to follow the spiral of the record, this effect being produced by the force conveyed directly through the diaphragm to the horn from the moving stylus. An equally good result cannot be accomplished in a machine in which the diaphragm does not rest

directly upon the record and in which there is some intermediate vibration-transmitting mechanism, such as a pivoted lever.

In the drawings I have illustrated a construction embodying the features of the present invention, in which—

Figure 1 is a side elevation, certain parts being in central vertical section. Fig. 2 is a similar view showing a different arrangement of parts. Fig. 3 is a plan view of the devices shown in Fig. 2. Fig. 4 is a section along line 4 4 of Fig. 1. Fig. 5 is a detail view, in vertical section, of parts shown in Fig. 1, but showing a modified form of tension-spring. Fig. 6 is a detail view, partly broken away, of a device for converting a rotary motion into a lateral motion and imparting the same to the stylus-carrying part at a rate proportional to the speed of rotation.

Like letters of reference refer to like parts of the several views of the drawings.

Referring to the drawings in detail, 1 represents the base of the instrument, which may be in any desired form; but it is shown as being made in the form of the conventional representation of a lyre.

2 represents a motor for actuating the spool carrying the record-cylinder, this being of any character and here shown as a spring-motor.

A governor 3 is shown for controlling the movements of the motor, this governor being likewise in any desired form.

A spindle 4 is provided for carrying the record-cylinder spool 5, said spindle being supported at one end only on a standard 6. The spool 5 has formed on it a portion 7, adapted to receive a belt transmitting rotary motion from the motor 2. On the spool is a worm-wheel 8, meshing with a part 9 to give lateral motion to the stylus-carrying part.

10 represents the record-cylinder, which is composed of any plastic material suitable for receiving and preserving a graphic representation of the movements of a sound, the diaphragm transmitting to it by a stylus.

Suitably positioned on the base is a post 11, adjustably secured in place by means of a screw 12, passing through a slot 13. This post is for the purpose of interchangeably

supporting different forms of sound-recording and sound-reproducing parts, and for this purpose is provided with a threaded socket 14.

Situated over or approximately over the central line of the record-cylinder are the devices which transmit the sound-vibrations to the recording-cylinder and which, acting conversely, reproduce them. These devices consist of a sound-chamber 15, having a diaphragm 16, to which is attached or integrally formed a stylus 17.

The construction here illustrated as embodying the invention is so constituted as to be capable of use with different forms of sound-conduits, whether for the purpose of transmitting sound-waves to the diaphragm to be by it graphically recorded on the cylinder through the medium of the stylus or for the purpose of reproducing from the record-cylinder the sound-waves so recorded. For instance, in Fig. 1 a bell-mouthed tube or megaphone 18 is shown, which may be used as a receiver for collecting, concentrating, and directing upon the diaphragm sound-waves entering it or may be used for the purpose of reproducing, magnifying, and distributing from the recording-cylinder sound-waves graphically represented thereon. This bell-mouthed tube is pivoted at its flaring end upon a stem 19, passing through it and having a threaded head 20 screwing into the socket 14, the narrow end being connected with the sound-chamber by means of a nipple 20.

In Figs. 2 and 3 the instrument is shown as designed for use in connection with an ear-tube. For this purpose the post 11 supports an extension 21, which is shown as secured to said post by means of a threaded projection 22, screwing into the socket 14. Secured to the extension 21 is a bracket 23, which is provided with a tube-section 24, into one end of which fits a flexible ear-tube, the other end receiving a tube 25, having a pivot-point 26 fitting a recess in the extension 21, the other end of this tube fitting into and carrying the sound-chamber, with its diaphragm and stylus.

When the instrument is used as a sound-recorder, it is essential that motion be given to the stylus in a direction longitudinally of the revolving recording-cylinder while the stylus is in contact therewith; and also when the instrument is used for the purpose of reproducing sounds previously recorded and graphically represented on the record-cylinder it is desirable (although not essential) that the stylus should be guided and controlled to follow the record-line of sound representations independently of the guiding action such line would have upon the stylus if it were left free to be guided thereby. These objects are accomplished by means of the worm-wheel 8 and part 9. This part 9 is formed of some material which may be easily serrated or indented, such as wood, and is provided with corrugations or teeth which are

the reciprocal of or are adapted to engage the spiral of the worm-wheel 8 to transform from the rotary motion of said wheel to the stylus a movement longitudinally of the recording-cylinder at a rate corresponding to the rate of revolution of the record-cylinder, said corrugations being formed in the piece 9 by pressing the same in contact with a worm-wheel similar to the one with which it is designed to coact when in operation. The part 9 is guided in its lateral movement by a grooved friction-roller 27, carried on a support 28, which support extends transversely across the instrument and is provided at the opposite side with a friction-roller 29, which supports and guides a rod 30, attached to the stylus-carrying part. (See Fig. 1.) The part 9 is secured to the stylus-carrying part on the opposite side.

An important feature of the present invention consists in the devices by which tension is imparted to the stylus-carrying part to cause the stylus to be kept in contact with the record-cylinder with a uniform degree of pressure. It is essential to the best operation of the instrument that the stylus should bear upon the record-cylinder always at right angles to the axial line of said cylinder and without any inclination, and as the stylus moves across longitudinally from end to end of the record-cylinder about a center of rotation the tension device to exert the required tension must be one which varies correspondingly. To provide for this, I have devised the constructions illustrated in the drawings, that construction shown in Figs. 1 and 2 consisting of a rod 31, provided with arms 32, pivoted in line with the point about which the stylus-carrying part oscillates. To the end of the arm 31 is secured a spiral spring 33, whose other end is attached to the stylus-carrying part. By this construction it will be seen that the spring exerts a constant tension upon the stylus-carrying part, and the arm 31, moving about the same center of oscillation as the stylus-carrying part itself, causes the spring to exert upon the stylus, through the medium of its support, a pressure always at right angles to the axial line of the record-cylinder, whatever the position of the stylus may be, and this irrespective of whether the instrument is placed in a true horizontal position or not. In Fig. 5 I have illustrated a modification of this tension device, in which the spring, instead of being secured to a rod, as in Figs. 1 and 2, is secured directly to an eye 34 in line with the pivotal point of the stylus-carrying part.

While I have described the use of the worm-wheel 8 and the part 9 for the purpose of controlling the movement of the stylus-carrying part longitudinally of the recording-cylinder both in the operation of recording sound and reproducing it, it is only absolutely essential when the instrument is used for the purpose of recording sound; but the use of these parts for controlling the movement of the stylus

during the operation of reproducing sound is an advantage in that the stylus is compelled to follow the line of sound representations upon the cylinder absolutely, as it is controlled by exactly the same devices which actuated it during the operation of recording the sounds, so that danger of the stylus leaving the line or groove of sound-records is obviated and the danger of injuring the cylinder by the stylus leaving the record-line and abrading the surface of the cylinder is done away with.

What is claimed as new is—

1. In an instrument for recording and reproducing sound, the combination of a sound-chamber having a diaphragm carrying a stylus and located in juxtaposition to the record-cylinder, of an adjustable post consisting of a fixed part 11 and the removable part 21 and sound-conduits of different forms adapted to be interchangeably supported thereby, substantially as specified.

2. In an instrument for reproducing sound, a pressure device consisting of a rod having pivotal arms in line with the pivotal point of the stylus-carrying part, and a spring attached to said rod and to the stylus-carrying part, substantially as specified.

3. In an instrument for recording and reproducing sound, the combination with a revoluble record-surface, of a sound-chamber carrying a diaphragm and stylus, a pivoted sound-conduit having its free end supported only by the sound-chamber, and its stylus, means for moving the pivoted sound-chamber and stylus about the pivotal point, means for pivotally supporting different forms of sound-conduits, and a pressure device operating to cause the stylus to press upon the record-cylinder at right angles to the axial line thereof throughout its path of movement, substantially as described.

4. In an instrument for reproducing sound, a pivoted stylus-carrying part, and a pressure device consisting of a rod having arms pivoted in line with the center about which the stylus-carrying part oscillates, and a spring secured to said rod and to the stylus-carrying part, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GIANNI BETTINI.

Witnesses:

E. D. GREENE,
B. L. CLARKE.

No. 619,916.

Patented Feb. 21, 1899.

D. S. WILLIAMS.
GRAPHOPHONE.

(Application filed Nov. 13, 1897.)

(No Model.)

2 Sheets—Sheet 1.

FIG. 1.

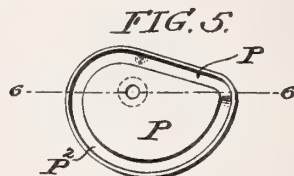
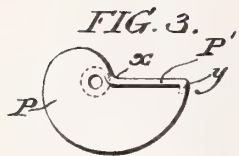
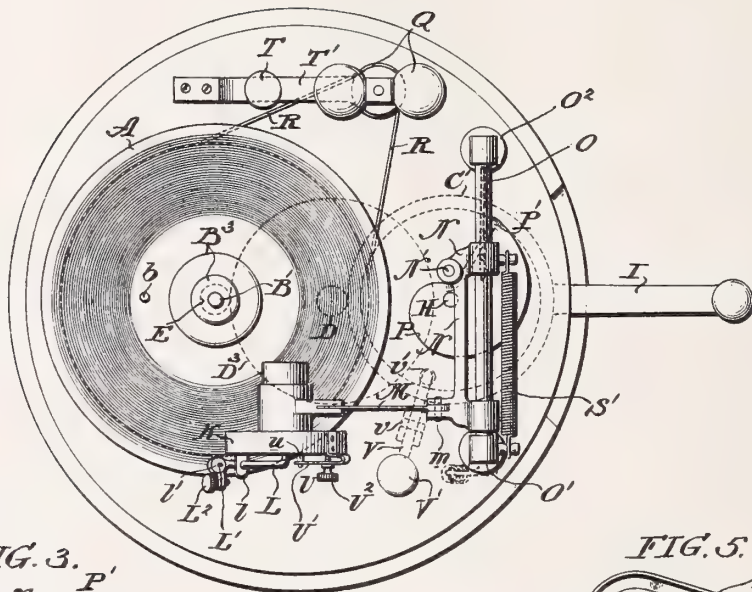
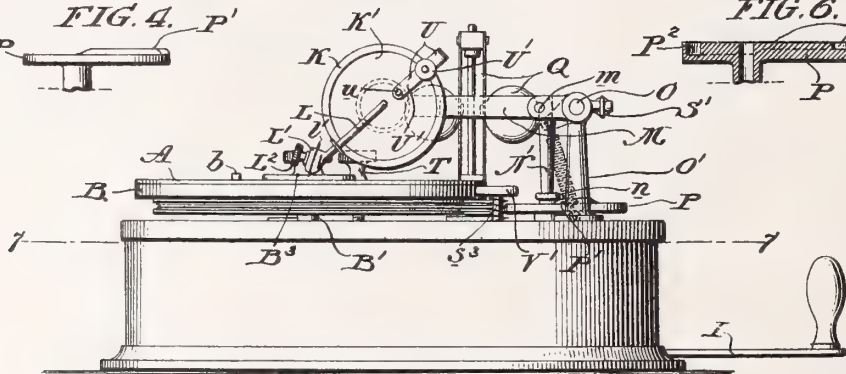


FIG. 2.



WITNESSES:

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Harry L. Johnson

INVENTOR

D. S. Williams

No. 619,916.

Patented Feb. 21, 1899.

D. S. WILLIAMS.
GRAPHOPHONE.

(Application filed Nov. 13, 1897.)

(No Model.)

2 Sheets—Sheet 2.

FIG. 7.

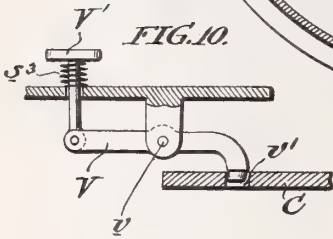
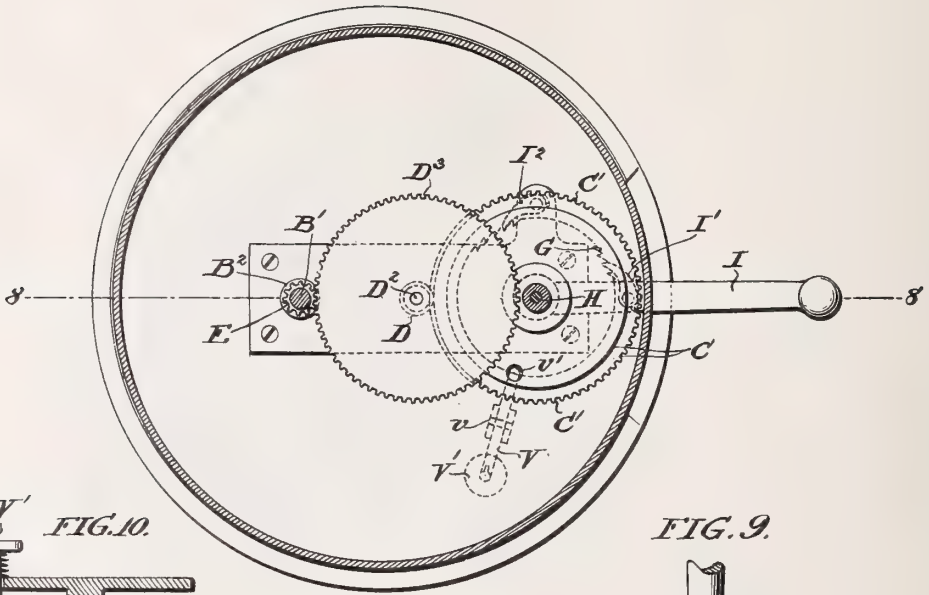


FIG. 9.

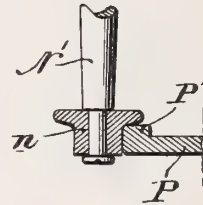
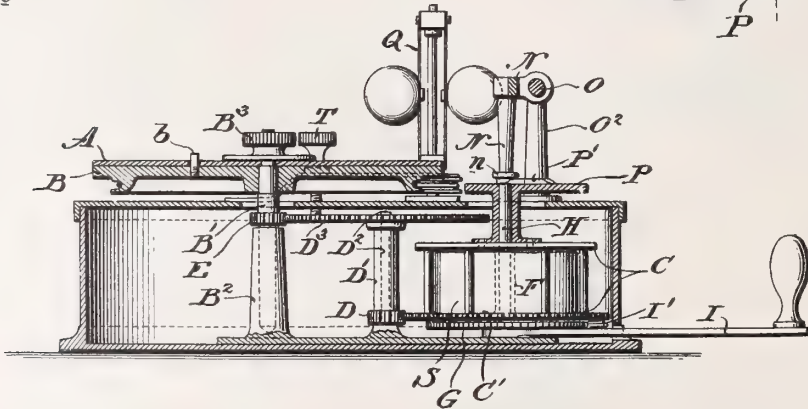


FIG. 8.



WITNESSES:

J. Norman Dixon
Harry L. Kinnear

INVENTOR

David S. Williams

UNITED STATES PATENT OFFICE.

DAVID S. WILLIAMS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JOSEPH A. VINCENT, OF SAME PLACE.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 619,916, dated February 21, 1899.

Application filed November 13, 1897. Serial No. 658,468. (No model.)

To all whom it may concern:

Be it known that I, DAVID S. WILLIAMS, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to a simple and inexpensive machine for recording and reproducing the sounds of the human voice, musical instruments, &c., and contemplates a device having a disk coated with a layer of wax upon which is engraved by the stylus a helical groove of even depth containing sinuosities constituting sound-waves recorded in accordance with the sounds imparted to the sound-box and stylus as the same is automatically propelled across the face of the disk.

The chief features of my invention are, first, the feeding mechanism for positively conveying the sound-box and stylus across the record-disk, raising the stylus from the record at the end of its travel, and conveying the sound-box and stylus back to its initial position at the identical point at which it started; second, in the construction and arrangement of the sound-box and stylus, and, third, in minor details of construction, which will be more fully treated of hereinafter.

Referring to the accompanying drawings, forming part of the specification, Figure 1 represents a plan view of a machine embodying the principle of my invention. Fig. 2 represents a side elevation of the machine. Fig. 3 shows a plan view of the feeding-cam detached from the machine. Fig. 4 represents a side elevation of the feeding-cam shown in Fig. 3. Fig. 5 represents a plan view of a modified feeding-cam similar to that shown in Fig. 3. Fig. 6 shows a vertical section of said cam on the line 6 6 of Fig. 5. Fig. 7 indicates a horizontal section of the machine on a line 7 7 of Fig. 2. Fig. 8 represents a vertical section of the machine on a line 8 8 of Fig. 7. Fig. 9 shows a detached sectional view of a portion of the feeding cam and roller

constituting a portion of the feeding mechanism, and Fig. 10 represents a detached sectional view of the stop-motion for checking the motion of the machine at the end of each operation.

Referring to the letters of the drawings, A represents a disk, formed of metal, hard rubber, or any other suitable material, provided upon its face with a coating of wax in a condition to offer very slight resistance to the action of the stylus while recording sounds. This disk I shall hereinafter refer to as the "record-disk."

The record-disk is mounted upon a table B, which rotates upon a vertical shaft B', supported in a long upright bearing B². The upper end of the shaft B' is threaded to receive the thumb-screw B³, which holds the record-disk firmly upon the table B, and a pin b, projecting therefrom, passes through a hole in the record-disk and locates the record-disk in its proper position. Motion is imparted to the table B, carrying the record-disk, by a spring S, which is inclosed in a casing C, the lower side of which has a spur-wheel C', which engages with a pinion D, mounted upon a sleeve D', which is supported upon a shaft D², and upon the upper end of the sleeve D' is secured a spur-wheel D³, which engages a pinion E, secured to the shaft B', which carries the table B.

The spring S is wound from the center, the inner end being secured to sleeve F, to which is also secured a ratchet-wheel G, both of which are supported upon a fixed central shaft H.

The spring S is wound by means of a lever I, which carries a spring-pawl I' for the purpose of engaging the ratchet-wheel G. A second spring-pawl I², which is secured to the bed-plate of the machine, also engages the ratchet-wheel G and acts as a retaining-pawl to hold the ratchet-wheel in position.

The sound-box K is provided in the usual manner with a diaphragm K', to which is firmly secured the stylus-lever L, the same being hinged or pivoted to the sound-box by a leaf-spring l or by any other well-known means employed for this purpose. The free end of the stylus-lever is provided with a

clamp L' , which is slotted to receive a fine steel or hard-metal wire l' of uniform diameter throughout, which constitutes the stylus and which is firmly held in the clamp by a thumb-screw L^2 . I desire to use this particular form of stylus both for recording and reproducing for the reason that where tapered points are employed (and I am led to believe that only such are used in common practice) the wearing away of the point has a tendency to vary the width of the groove and widen the same as the operation of recording and reproducing the record progresses, and thus tends to materially injure and shorten the life of the record.

The sound-box K is secured to a lever M , which is preferably rigid; but where the machine is employed to reproduce record made upon other machines I prefer to make the same flexible to allow for any inequalities which may exist, said lever being pivoted at a point m to the bracket N , which is guided upon a bar O , secured to and supported by posts O' and O^2 , fastened to the top of the machine. Depending from the bracket N is the bar N' , provided at the lower end with a roller n , which engages a cam P , by means of which the sound-box and stylus are fed across the record.

The cam P , which I shall hereinafter designate as the "feeding-cam," is operated by the spring-casing, although it will readily be understood that the same may be driven through intermediate gearing from any part of the machine.

The feeding-cam P is so constructed as to impart a uniform feed to the stylus from the beginning of its operation at a point x to the end of its forward feed at a point y . At the latter point the roller is forced up an incline, which raises the stylus from the record, and as the feeding-cam continues to move the roller is carried over the elevation P' by the action of the spring S' until it reaches the point X , where it leaves the elevated portion of the cam and brings the stylus again in contact with the record.

I have illustrated in Figs. 5 and 6 a somewhat modified form of feeding-cam, by the use of which the spring S' may be dispensed with, the roller n in this case being positively guided in the groove P^2 and the raising and lowering of the stylus being effected by means of the elevation P^3 at the bottom of the cam.

The governor Q is of the ordinary type commonly employed in sound recording and reproducing machines, the same being driven from the table B by means of a belt R or by a train of gearing, if desired, and regulated by a screw T , acting upon a lever T' , all of which is old and well known in machines of this character.

In order to prevent harsh and grating sounds which frequently occur in the sound-box, I desire to provide the same with a damper U , the same comprising a spring U' , secured at

one end to the sound-box and provided at the other with a rubber button u , which rests against the diaphragm. By adjusting the thumb-screw U^2 the button may be brought to bear with greater or less pressure upon the diaphragm and the harsh sounds by this means may be overcome.

In order to automatically stop the machine after the operation of recording or reproducing, I provide a lever V , pivoted at a point v , one end of said lever being adapted to an opening v' in the spring-casing or other moving part of the machine, the other being pivoted to a push-button which is acted upon by a spring s^3 , which tends to keep the lever in engagement with the opening in the spring-casing. By pressing the button V' the lever is released and the machine free to operate.

As shown in the accompanying drawings, the weight of the sound-box is intended to give sufficient pressure to engrave the groove in the record when recording in soft wax; but, if desired, an additional weight or spring may be employed to increase the pressure without in any way departing from the scope of my invention.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A sound recording and reproducing instrument, comprising a record-disk suitably supported upon a shaft, means for operating said shaft, a sound-box provided with a stylus adapted to the record-disk, a bracket carried by a stationary bar which is adapted to guide the sound-box and stylus, a cam operated from the source of power, the same being adapted to slowly feed the stylus across the face of the record-disk to lift the stylus from the record at the end of its forward travel and return the stylus in an elevated position with a quick movement to its initial position.

2. A sound recording and reproducing instrument comprising a record-disk detachably secured to a table which is rotated by a central shaft, means for rotating said shaft, a sound-box provided with a stylus adapted to the record-disk, a bracket carried by a stationary bar for guiding the stylus and sound-box, a short lever connected to the sound-box at one end and pivoted to the bracket at the other, a roller carried by an arm projecting from said bracket and a cam operated from the source of power and adapted to engage said roller and convey the sound-box and stylus forward across the face of the record, to raise the stylus at the end of its forward movement and convey the stylus backward in an elevated position to the starting-point.

3. A sound recording and reproducing instrument comprising a record-disk detachably secured to a table rotated upon a vertical shaft, spring means for rotating said shaft, a sound-box provided with a diaphragm and stylus adapted to the record-disk, a bracket guided upon a horizontal bar, a lever secured to the sound-box and pivotally connected to

said bracket, a roller carried by a depending arm of said bracket, and a cam rotated from the source of power having a portion adapted to slowly carry the stylus across the face of the record-disk, an inclined portion for raising the stylus from the record-disk and a quick return motion for operating the sound-box and stylus while in an elevated position to the starting-point.

4. A sound recording and reproducing instrument comprising a record-disk suitably supported and rotated upon a central shaft, means for rotating said shaft, a sound-box provided with a diaphragm having centrally connected thereto a stylus-lever which is pivoted to the sound-box, a clamp formed upon the free end of said stylus-lever, a stylus of fine wire secured in said clamp, a bracket pivotally secured to the sound-box and guided by a stationary bar, a roller carried by said bracket, a cam for acting upon said roller to convey the stylus forward across the face of the record-disk to elevate the stylus at the end of its forward travel and retain the stylus in an elevated position during its return movement, and a spring to return the stylus to its initial position.

5. A sound recording and reproducing instrument, comprising a record-disk suitably supported and rotated upon a central shaft, means for rotating said shaft, a sound-box provided with a diaphragm and stylus-lever, the latter being connected at one end to the diaphragm and fulcrumed to the sound-box, a clamp formed upon the free end of the stylus-lever, a stylus formed of fine hard-metal wire adapted to form and traverse the groove of the record, an adjustable damper secured to the sound-box and provided with an elastic button which rests against the diaphragm, a bracket guided upon a fixed bar and pivotally connected to a projecting arm of the sound-box, an arm projecting from said bracket and provided with a roller, a cam rotated from the source of power adapted to engage said roller and to carry the stylus forward and backward across the face of the record-disk, a projecting ledge upon said cam for holding the stylus out of engagement with the record-disk during the return movement, and a spring to keep said roller in engagement with said cam.

6. In a sound recording and reproducing machine, the combination of the sound-box and stylus, a rotating record, a cam adapted to feed the stylus forward across the record, to lift the stylus from the record at the end of its forward movement and retain the same in an elevated position during the backward movement, and means as a spring working in conjunction with said cam to return the stylus to its initial position.

7. In a sound recording and reproducing machine, the combination of the sound-box and diaphragm, a stylus-lever secured at one end to the diaphragm and fulcrumed to the sound-box by a leaf-spring, the same having

formed upon the opposite end a clamp provided with an adjustable stylus-wire, a cam adapted to feed the stylus forward across the record-disk, and being provided with a raised portion upon its face to elevate the stylus at the end of its forward movement and a spring acting in conjunction with the movement of said cam to return the stylus while in an elevated position to the starting-point.

8. In a sound recording and reproducing machine, the combination of the sound-box and diaphragm, a stylus-lever pivoted to the sound-box and fixedly secured to the center of the diaphragm, a clamp formed upon the free end of the stylus-lever, a hard-metal stylus preferably formed of fine wire firmly held in said clamp, an adjustable damper secured at one end to the sound-box and having an elastic button which by means of an adjusting-screw can be applied with greater or less pressure against the diaphragm, and a cam adapted to feed the stylus forward across the record-disk, to elevate the stylus at the end of its forward travel, and to return the stylus in the elevated position back to the starting-point.

9. In a sound recording and reproducing machine, the combination of a rotating record-disk, a diaphragm and stylus adapted to said record, and a cam adapted to feed the stylus forward across the record-disk to elevate the stylus at the end of its forward travel, and to return the stylus in its elevated position back to its initial position.

10. In a sound recording and reproducing machine, the combination of the record-disk, A, suitably supported and rotated, the sound-box, K, diaphragm, K', and stylus-lever, L, the clamp, L', and stylus, L'', a cam, P, operated from the source of power and adapted to convey the stylus forward and backward across the record-disk, said cam having an elevated portion, P', for raising the stylus out of engagement with the record upon its return movement.

11. In a sound recording and reproducing machine the combination of the sound-box and stylus, a rotating record-table adapted to contain a record-disk, a central stem, provided with a thumb-screw for holding the record in position, a pin, b, upon the record-table adapted to a hole in the record, a cam for feeding the stylus forward across the record, an elevated ledge upon said cam to lift the stylus from the record at the end of the forward travel, and to retain the same in an elevated position during its backward movement, means as a spring acting in conjunction with said cam to return said stylus, and a locking device as shown to automatically secure the mechanism against turning after the cam has completed a revolution.

12. In a sound recording and reproducing machine, the combination of the table, B, the shaft, B', the record-disk, A, adapted to said shaft, a pin, b, to locate the position of the

5 record upon the table, a sound-box provided with a diaphragm, a stylus-lever connected to the diaphragm and provided with a clamp, L, the stylus-wire, *l*, a cam, P, operated from the source of power and adapted to convey the stylus forward and backward across the record-disk, said cam having an elevated portion for raising the stylus out of engagement with the record upon its return movement,

and a spring-actuated lever, V, for locking the mechanism against movement.

In testimony whereof I affix my signature in presence of two witnesses.

DAVID S. WILLIAMS.

Witnesses:

WALTER C. PUSEY,
THOS. K. LANCASTER.

No. 620,823.

Patented Mar. 7, 1899.

I. ANDION.
GRAPHOPHONE.

(Application filed Jan. 3, 1898.)

(No Model.)

Fig 1

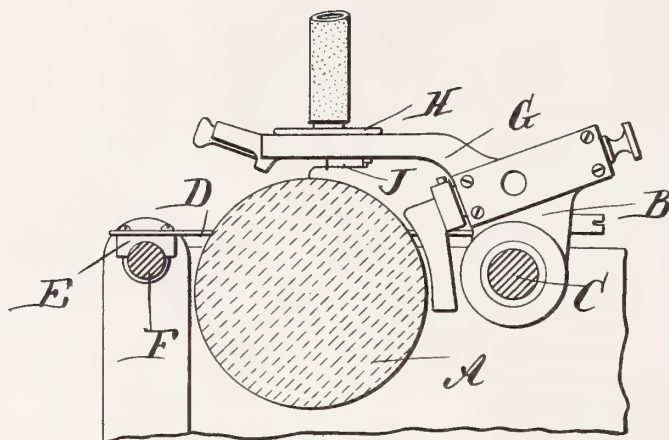
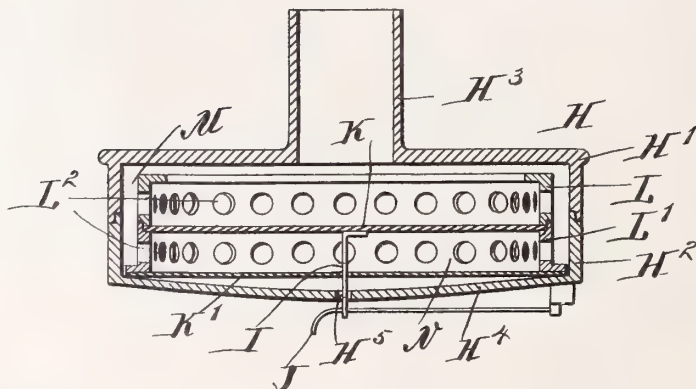


Fig 2



WITNESSES:

H. Walker
John Lottka

INVENTOR

I. Andion.

BY

Munn & Co.

ATTORNEYS.

UNITED STATES PATENT OFFICE.

INOCENCIO ANDION, OF NEW YORK, N. Y.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 620,823, dated March 7, 1899.

Application filed January 3, 1898. Serial No. 665,300. (No model.)

To all whom it may concern:

Be it known that I, INOCENCIO ANDION, a subject of the King of Spain, residing in New York city, county and State of New York, have invented a new and Improved Phonograph, of which the following is a full, clear, and exact description.

My invention relates to phonographs, and particularly to the recorders and reproducers thereof.

The object of my improvement is to increase the volume of the sound in a reproducer or in a recorder to secure a more perfect recording action by concentrating the sounds and preventing the scattering or loss thereof. This object I attain by means of a novel construction, such as is hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a broken sectional elevation of a phonograph, showing the recording-cylinder in transverse section; and Fig. 2 is a sectional elevation of the reproducer.

A is the phonograph-cylinder, and B the carriage, slidable longitudinally upon the rod C and having an arm D, carrying a half-nut E in engagement with the feed-screw F. The carriage has an arm G, upon which is mounted the recorder or reproducer H. So far as described the parts may be constructed and arranged as in the ordinary construction of phonographs. The reproducer H, however, is located so as to be horizontal—that is, about midway between the guide-rod C and the feed-screw F—instead of being disposed obliquely adjacent to the feed-screw, as in the ordinary construction. This arrangement reduces the weight of the arm G and renders the apparatus more sensitive.

The reproducer proper, H, as shown in detail in Fig. 2, consists of a separable shell H¹, one half of which carries a nipple H³, adapted for connection with a reproducing-horn or with hearing-tubes in the well-known manner. The other half of the shell H² has a concaved bottom H⁴, which is solid, except for a central perforation H⁵, through which passes the pin I, adapted to operate the stylus J. I desire it to be understood that any suit-

able or approved connection may be employed between the stylus J and the pin I. The latter is secured rigidly to the main (mica) diaphragm K, which is held between two rings or collars L L', located within the shell H¹ H², but spaced from the cylindrical walls thereof, so as to afford an annular chamber M in communication with the interior of the nipple H³. The rings L L', in conjunction with the bottom H⁴, form a diaphragm-holder. Each of the collars L L' is provided with a series of perforations L² in its cylindrical wall, so that the annular chamber M communicates directly with the space below the diaphragm and also with the space above the same. The perforations in the upper ring L may be omitted without entirely sacrificing the advantages of my invention; but I believe that better results will be obtained when peripheral perforations are provided both above and below the diaphragm. The diaphragm may be held upon a shoulder of the lower ring L' by an interior flange at the bottom of the upper ring L.

The lower ring L' is used to hold in position against the marginal portion of the concaved bottom H⁴ a supplementary diaphragm K', which may be made of paper or other vegetable material or any suitable substance. This diaphragm has a small central perforation through which the pin I passes; but the diaphragm engages the pin tightly enough to prevent the downward escapement of sounds.

It will be obvious that the sounds produced by the vibration of the diaphragm K cannot escape downward, as the supplementary diaphragm K' will reflect upwardly any vibrations set up in the chamber N, contained between the two diaphragms, and as said chamber communicates, through the perforations in the lower ring L', with the annular chamber M and the nipple H³ it will be evident that the vibrations of the air on the lower face of the main diaphragm will reach said nipple as well as the vibrations of the air on the upper side of the diaphragm. There will therefore be no loss of sound, since the auxiliary diaphragm K' completely closes the chamber N and the aperture H⁵ in the dished or concaved bottom H⁴ is very small.

It will be understood that the construction hereinbefore described may, with slight obvi-

ous changes, be applied to a phonograph-recorder as well as to a reproducer, since these two parts of the apparatus are similarly constructed.

5 Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A phonograph recorder or reproducer, comprising an exterior shell, a diaphragm-holder of smaller diameter than the shell located within the shell and spaced therefrom peripherally so as to form an annular chamber between the shell and the holder, and two spaced diaphragms in the holder, the latter being apertured peripherally between the diaphragms so that the chamber between the diaphragms communicates with that between the shell and the diaphragm-holder.

2. A phonograph recorder or reproducer, comprising an exterior shell, a diaphragm-holder located therein and spaced therefrom peripherally so as to form an annular chamber between the shell and the diaphragm-holder, the shell being provided at the top with an aperture communicating with said annular chamber, and two spaced diaphragms located in said holder, the latter being apertured peripherally between the two diaphragms.

3. A phonograph recorder or reproducer, comprising an exterior shell, a diaphragm-holder located within the shell and spaced therefrom so as to form a chamber between the shell and the holder, and two spaced diaphragms in the holder, the latter being apertured peripherally between the diaphragms so that the chamber between the diaphragms

communicates with that between the shell and the diaphragm-holder, the holder being also further apertured peripherally above the upper or main diaphragm.

4. A phonograph recorder or reproducer, comprising an exterior shell having a dished bottom provided with a central aperture, a holder located within the shell and spaced therefrom peripherally, a main diaphragm in the holder, an auxiliary diaphragm between the holder and said dished bottom, said auxiliary diaphragm being centrally apertured, and the holder being peripherally apertured between the two diaphragms, and a pin secured to the main diaphragm and extending tightly through the auxiliary diaphragm and loosely through the bottom of the shell.

5. A phonograph recorder or reproducer, comprising an exterior shell, a diaphragm-holder of smaller diameter than the shell located within the shell and spaced therefrom peripherally so as to form an annular chamber between the shell and the holder, the holder being open at one end and the shell being provided at the adjacent end with a nipple for the passage of sound-waves, a diaphragm located at the opposite end of the holder and closing said end, and a second diaphragm located within the holder about midway between the ends thereof, the holder being apertured peripherally both above and below said central diaphragm.

INOCENCIO ANDION.

Witnesses:

JNO. M. RITTER,
JOAQUIN MACHADO.

No. 621,821.

Patented Mar. 28, 1899.

J. W. KEMP.
TRUMPET FOR GRAPHOPHONES, &c.

(Application filed Sept. 16, 1898.)

(No Model.)

2 Sheets—Sheet 1.

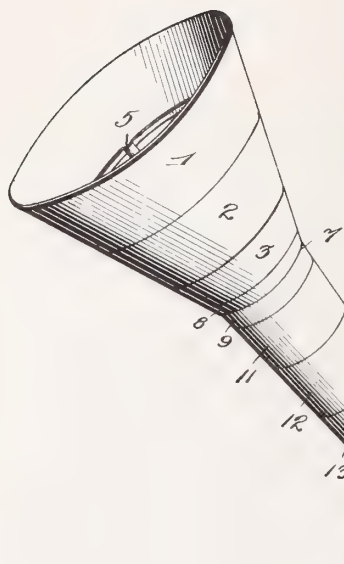


Fig. 1.

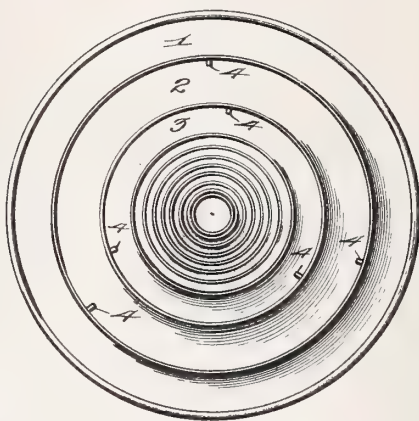


Fig. 4.

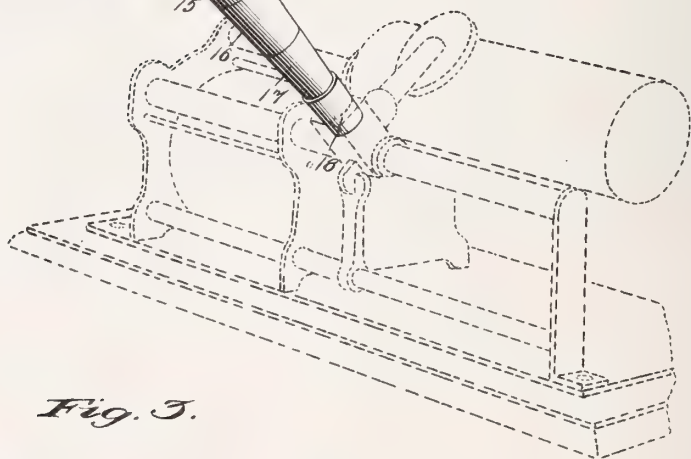
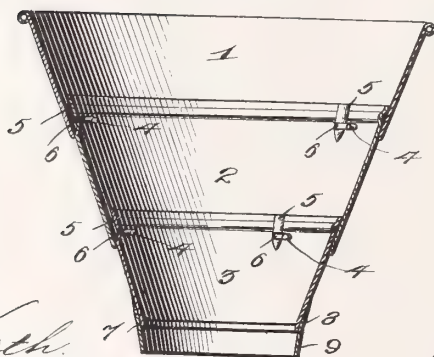


Fig. 3.



Witnesses

St. North.
Geo. H. Byrne

Inventor
James Whiteford Kemp.
By *J. D. McElary,*
Attorney.

No. 621,821.

Patented Mar. 28, 1899.

J. W. KEMP.
TRUMPET FOR GRAPHOPHONES, &c.

(Application filed Sept. 16, 1898.)

(No Model.)

2 Sheets—Sheet 2.

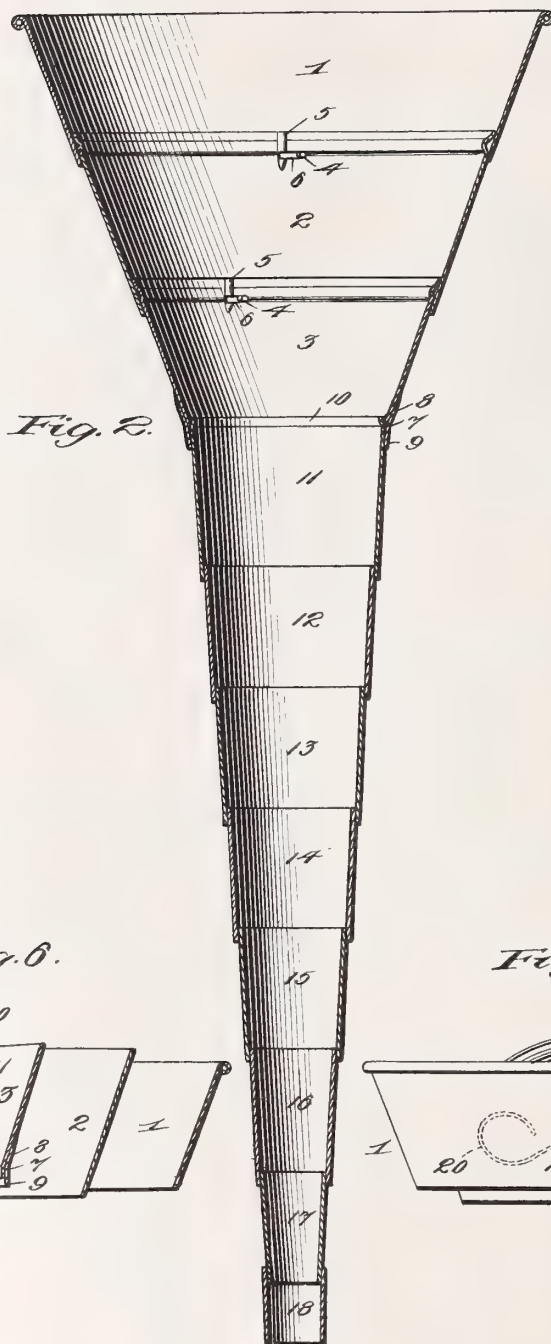


Fig. 6.

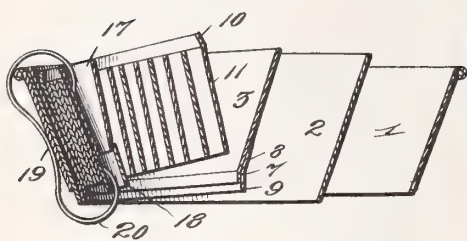
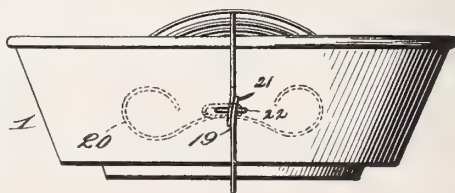


Fig. 5.



Witnesses

W. D. North.
Geo. H. Byrne

Inventor
James Whiteford Kemp,
By *J. M. Kelany,*
Attorney.

UNITED STATES PATENT OFFICE.

JAMES WHITEFORD KEMP, OF BALTIMORE, MARYLAND.

TRUMPET FOR GRAPHOPHONES, &c.

SPECIFICATION forming part of Letters Patent No. 621,821, dated March 28, 1899.

Application filed September 16, 1898. Serial No. 691,067. (No model.)

To all whom it may concern:

Be it known that I, JAMES WHITEFORD KEMP, a citizen of the United States, residing at Baltimore city, in the State of Maryland, have invented certain new and useful Improvements in Trumpet Attachments for Graphophones, &c.; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to trumpets of the class employed with graphophones or like sound-producing instruments for amplifying the sounds issuing therefrom.

A serious objection to the trumpet or sound-tube now in use with graphophones is that it is cumbersome and bulky, and therefore inconvenient to transport or to carry from place to place by hand.

The object of my invention is to provide a device of this character which may be readily closed together into small compass to permit of its being packed within the case of the instrument with which it is used or otherwise disposed of to occupy a small space when not required for use.

The characteristic features of the invention will be fully described hereinafter and defined in the appended claims.

In the accompanying drawings, which form a part of this specification, Figure 1 is a perspective view of the improved trumpet, its application to a graphophone being illustrated in dotted lines. Fig. 2 is a central longitudinal section of the same. Fig. 3 is a sectional detail view of the flaring mouth or bell-shaped end of the trumpet detached from the body portion thereof and illustrating means for detachably connecting the rings or sections of said mouth end. Fig. 4 is a side elevation illustrating the trumpet-sections closed together in the position they occupy when not required for use, and Figs. 5 and 6 illustrate means for preventing the sections from separating when folded together.

The mouth of the trumpet comprises a plurality of coacting ring-sections (three being shown in the drawings) 1, 2, and 3, each of

which is smaller in circumference at its inner than at its outer edge. These sections 1, 2, and 3 are of graduated sizes, the outer one, 1, being larger than the section 2 and the latter larger than the innermost section 3, so that they fit within one another in such a manner that the outer edges of the rings 2 and 3 will bind against the contracted edges, respectively, of the rings 1 and 2. To prevent the accidental disengagement of the sections, I provide the outer section 1 near its inner edge with inwardly-projecting lugs or pins 4, disposed at equal distances apart and adapted to register with vertical grooves 5, formed by indenting the outer edge of the section 2. The inner end of each of these grooves 5 communicates with or intersects an elongated slot 6, formed in the section 2 at a right angle to the groove. The inner edge of the section 2 is also provided with a series of inwardly-extending pins 4, which are adapted to engage grooves 5 and slots 6 in the outer edge of the section 3. It will be obvious that by bringing the pins 4 opposite the grooves 5 and then forcing the sections together the pins are caused to enter the slots 6, when by slightly turning the sections the pins are turned out of alinement with the grooves, thus securing the sections together. The inner section 3 of the trumpet-mouth is provided at its inner edge with an annular band 7, the outer edge 8 of which is slightly flared to conform to the inclined surface of the section 3, while its inner edge 9 closely fits the inwardly-beveled edge 10 of the outer section 11 of the body portion of the device.

The body portion consists of a number of overlapping sections, as 11, 12, 13, 14, 15, 16, and 17, graduated in size, as clearly shown in the drawings, and adapted, when the trumpet is expanded for use, to bind one within the other, but capable of telescoping one within another, as illustrated in Fig. 4.

The smaller or innermost section 17 of the trumpet is provided with a reinforced or thickened ring 18, designed to serve as a socket to fit upon the projection of the graphophone.

While the means above described for detachably connecting the sections of the mouth-piece of the trumpet have been found effective, I do not limit myself thereto, but desire to include as within the scope of the inven-

tion any suitable devices for detachably securing the sections together.

While of course it will be understood that I do not restrict myself to any particular metal or other material in the construction of the trumpet, I may state that it is preferably made of brass or other light sheet metal suitably polished or ornamented.

It will be clear from the foregoing description and from the drawings that when the device is to be used the several telescopic sections are distended into the position shown in Fig. 1 and then attached to the projection of the graphophone, and when not required for use the sections are collapsed, as shown in Fig. 4.

When the sections are in the position shown in Fig. 4, it is desirable that they be so supported as to prevent the smaller sections from dropping through the larger ones, and thus disarranging their proper relation. To provide for this, I employ a clasp, preferably consisting of a single piece of spring-wire 19, bent inwardly at its ends to form hooks 20, which embrace the assembled edges of the sections and enter the opposite ends of the inner section 17, as shown. This clasp may be either pivotally secured to the outer surface of the section 1 of the mouthpiece, as shown in Fig. 6, or may be made separate therefrom, as shown in Fig. 5. The clasp 19 is secured to the section 1 by forming a loop 21 at the center of the clasp, which engages a loop 22, projecting from the section 1, as shown in Fig. 6. It will thus be seen that I provide means for securing the parts together in their closed position without closing or obstructing any part of the mouth of the trumpet.

The clasp 19 when secured to the section 1 and not in use may be turned to the position shown in dotted lines in Fig. 5, so as not to extend over the edge of the mouth to affect in the slightest degree the sound-waves.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A trumpet attachment for graphophones, &c., comprising a flaring mouthpiece consisting of collapsible sections, provided with catches for detachably securing them together, and an annular band, in combination with a body portion consisting of collapsible sections, the outer section being inclined inwardly to fit the band of the mouthpiece while the inner section is provided with a thickened ring or socket.

2. A trumpet attachment for graphophones, &c., comprising a flaring mouthpiece consisting of collapsible sections detachably secured together by pins projecting therefrom and co-acting with grooves and slots in the next adjacent section, in combination with a body portion made up of collapsible sections, and provided with a socket for its attachment to a graphophone.

3. The combination with a trumpet consisting of collapsible ring-sections, of a clamping device comprising a spring-wire bent at its ends to form hooks to engage the edges of the sections and to enter the opposite ends of the smallest of the sections.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES WHITEFORD KEMP.

Witnesses:

SIMON I. KEMP,
THORNDIKE CHASE.

No. 621,834.

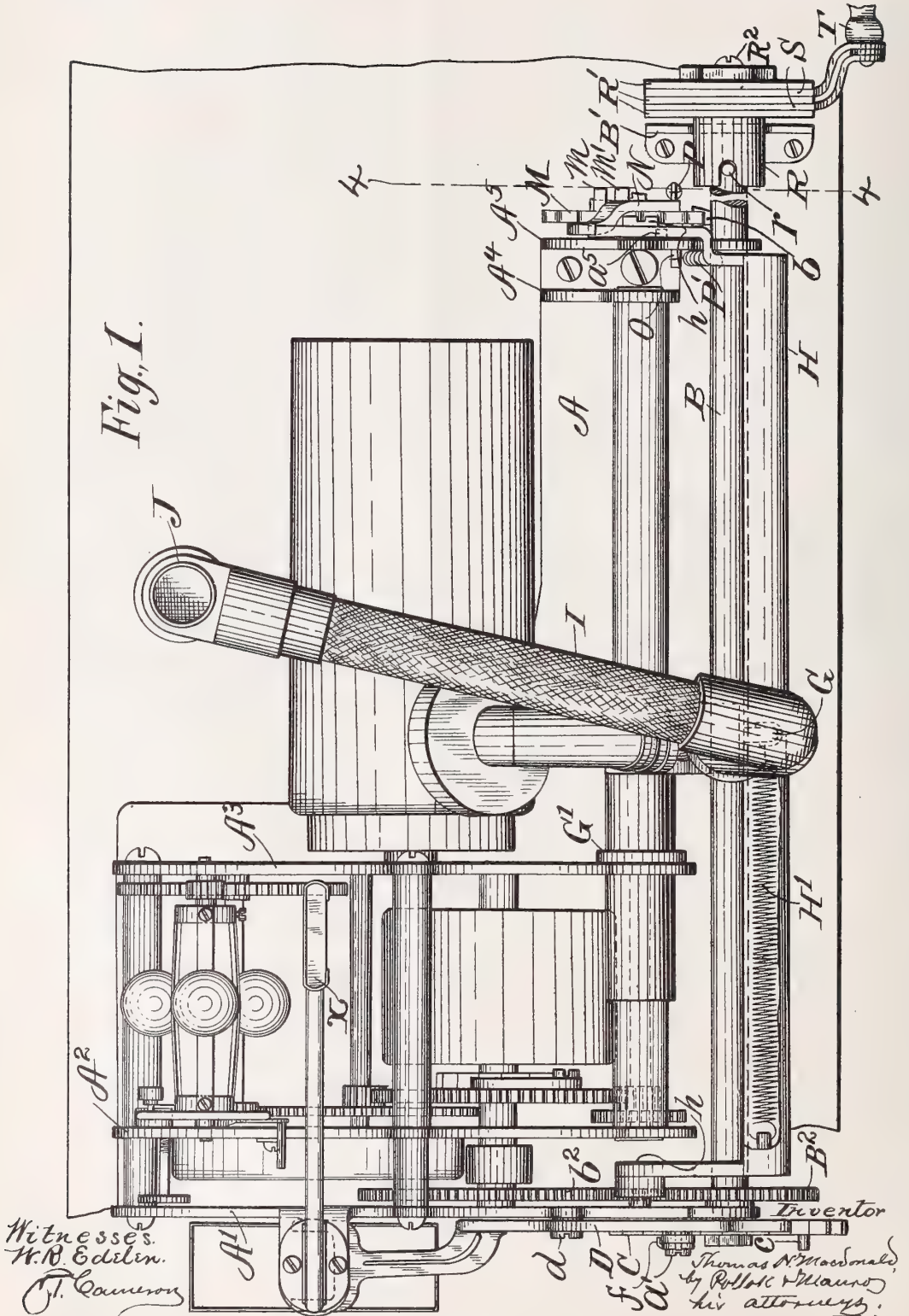
Patented Mar. 28, 1899.

T. H. MACDONALD.
COIN CONTROLLED GRAPHOPHONE.

(Application filed Oct. 31, 1898.)

(No Model.)

3 Sheets—Sheet 1.



No. 621,834.

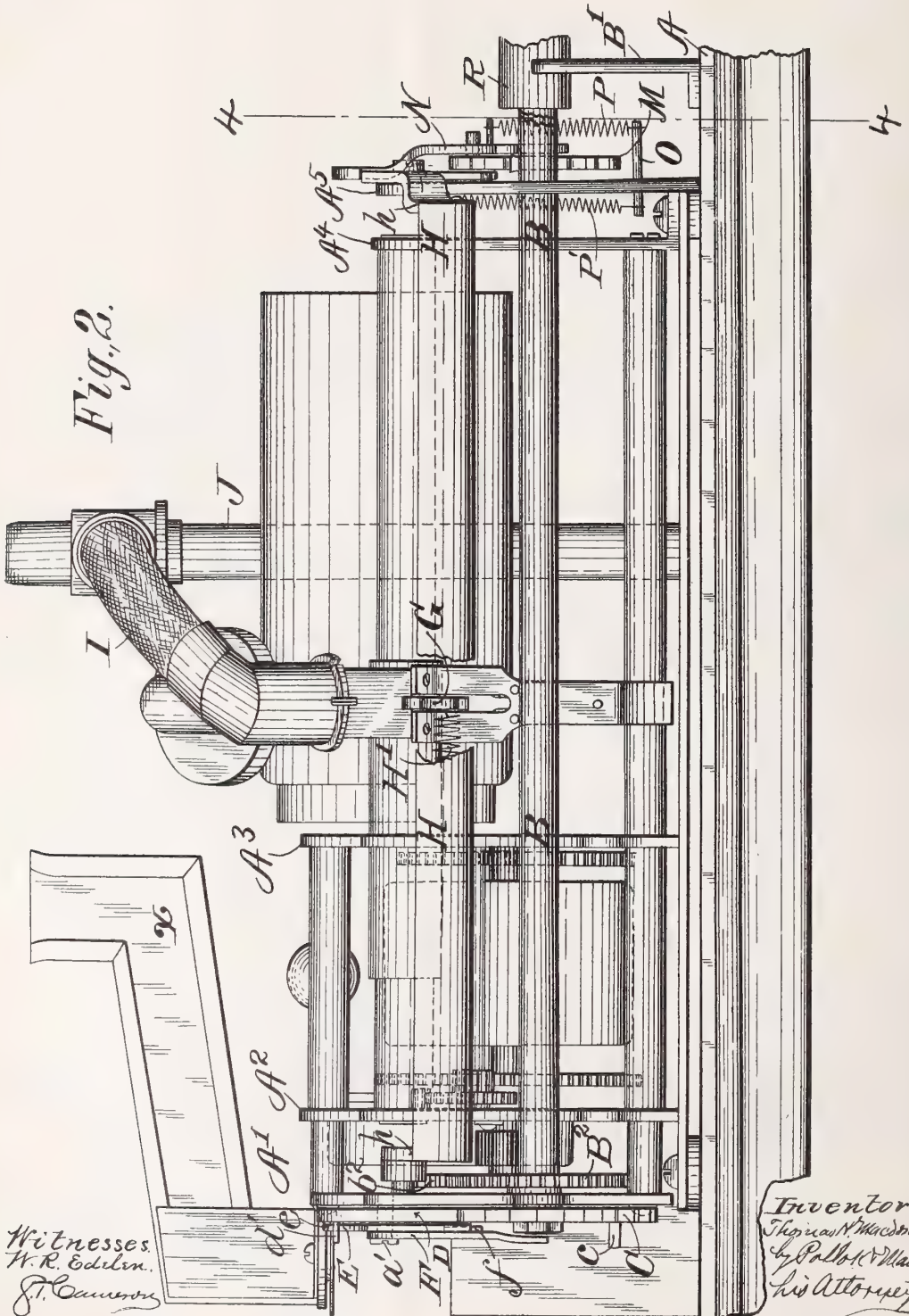
Patented Mar. 28, 1899.

T. H. MACDONALD.
COIN CONTROLLED GRAPHOPHONE.

(Application filed Oct. 31, 1898.)

(No Model.)

3 Sheets—Sheet 2.



No. 621,834.

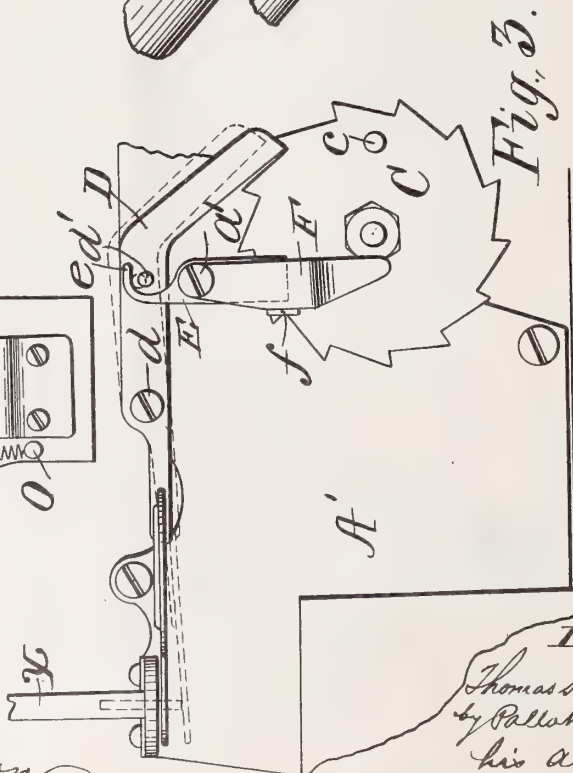
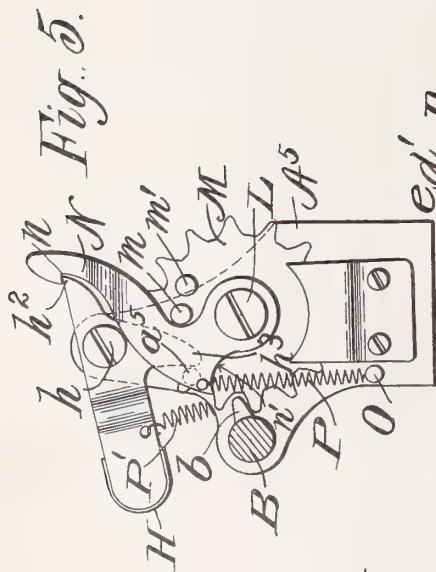
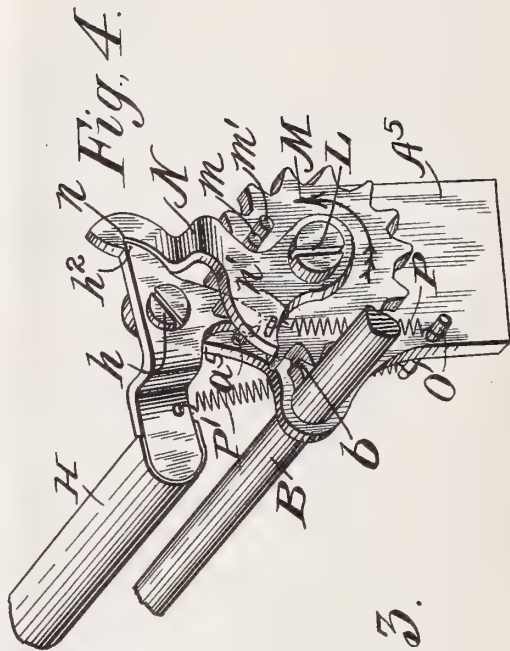
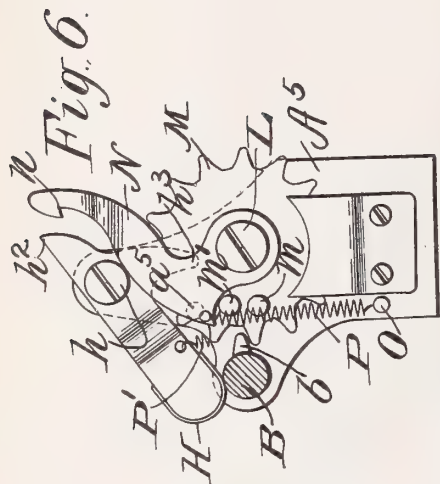
Patented Mar. 28, 1899.

T. H. MACDONALD.
COIN CONTROLLED GRAPHOPHONE.

(Application filed Oct. 31, 1898.)

3 Sheets—Sheet 3.

(No Model.)



Witnesses.
H. R. Edison.

J. T. Cameron

Inventor
Thomas H. Macdonald
by Ballou & Mauro
his attorneys.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

COIN-CONTROLLED GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 621,834, dated March 28, 1899.

Application filed October 31, 1898. Serial No. 695,046. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a resident of Bridgeport, Connecticut, have invented a new and useful Improvement in Coin-
5 Controlled Graphophones, which invention is fully set forth in the following specification.

My invention relates to coin-controlled graphophones, and is herein described as applied to the well-known spring-actuated
10 graphophone. It provides means for locking the spring-motor against winding until the proper coin has been dropped into the slot, for throwing the reproducer into contact with the sound-record and the partial nut of the
15 carrier into engagement with the feed-screw, for holding these parts in position while the sound-record is being reproduced, for disengaging them at the end of the performance, for returning the parts to their initial positions, and for other purposes hereinafter described.

In United States Patent No. 582,754, granted to me May 18, 1897, I have shown a coin-controlled graphophone which accomplishes most
25 of the results above mentioned, and the invention embodied in the present application is an improvement thereon, whereby the construction is greatly simplified and the cost of manufacture much reduced.

In the drawings forming a part of this specification I have illustrated one form which my invention may assume, in which drawings—

Figure 1 is a plan, and Fig. 2 a front elevation, of my invention as applied to the well-
35 known spring-actuated graphophone. Fig. 3 is a detail view showing the coin-lever and lock mechanism. Fig. 4 is a perspective of a section taken on the line 4 4 of Figs. 1 and 2; and Figs. 5 and 6 are end elevations on the
40 same section-line, showing the parts in operative and inoperative positions, respectively.

In the figures, in which like letters refer to like parts throughout, A is the base-plate, which is fastened to a wooden base, forming
45 the bottom of the inclosing box. (Not shown.)

A¹, A², A³, A⁴, and A⁵ are vertical bearing-plates secured to the base A, and B is the winding-shaft, turning in bearing-plates A¹ A⁵ and supported at its outer end by the bearing B¹ and carrying at the other end, next to
50 the bearing-plate A⁵, the gear-wheel B², which

in turn engages gear-wheel b² on the shaft that carries the spring, as will be clearly understood. Situated on the extreme end of the shaft B, beyond A¹, is the ratchet C.

D is the coin-lever, pivoted at d on A¹ and so weighted that its nose drops into engagement with the ratchet C, thus locking shaft B against winding. The other end of lever D is carried back beneath the opening of the
55 coin-chute x and is in the shape of a horizontal forked plate, the space between the arms of the fork being narrow enough to arrest the coin and hold it without passing. A stud a' is mounted on plate A¹ and projects out-
60 ward between ratchet C and the forward end of lever D. Levers E and F are pivoted on this stud, the former having a hook e, normally extending slightly above the stud d' on the lever d. The lower end of lever E lies against
65 an intumed flange f, projecting from the rear of lever F. When the coin is dropped into the slot and passes through the chute, it strikes at each side the arms of the fork, and thereby overbalances the forward end of lever
70 D and raises its nose from engagement with the ratchet C. The coin is not at this time allowed to pass off the lever, as the latter is held against its extreme tipping movement by the engagement of hook e with stud d'.
75 While the coin remains on the lever the latter cannot engage the ratchet C and the machine may be wound. When the machine begins to run, however, a stud c on the face of the ratchet-wheel C strikes against the
80 rear of the lever F and pushes it out of the way, and as flange f on lever F engages lever E it carries the latter, with the lever F, in its swing. The result of this is that hook e is freed from the stud d' and the weight of the
85 coin depresses the lever D till the coin drops therefrom, thereby permitting the nose of lever D to again engage the ratchet C. This position of the lever D does not interfere with the further rotation of the ratchet in the op-
90 eration of the machine, but will prevent any winding action without first introducing another coin. It is to be observed that while the spring is being wound stud c strikes against the front of lever F and pushes it
95 out of the way without disturbing lever E.

The reproducer is mounted upon a carrier

that is driven along the feed-screw by means of a partial nut in the usual manner and has a rearwardly-extending shifting-lever G for throwing the reproducer and the nut into and out of engagement with the sound-record and feed-screw, respectively.

II is a bar or bail pivoted at h to the bearing-plates A' and A⁵. The main portion of the bar or bail is trough-shaped and fits around the end of the shifting-lever G, so as to have sliding engagement therewith. When the bail II is in its lower position, the reproducer is lifted away from the record and the nut from the feed-screw; but when the bail is lifted it throws these parts into operative engagement in the well-known manner. A spring H', located in the trough of the bail, serves to retract the carriage, with the reproducer, to its initial position when the nut is released from the feed-screw.

Sound is conveyed from the reproducer through a flexible tube I, which passes rearward over the sound-record, as shown, and has a telescopic engagement with a collar free to turn on a standard J. The upper portion of J is hollow and communicates by means of an opening in its side with the tube I. The end of standard J projects through the boxing that incloses the machine and carries the horn or tube. (Not shown.)

Referring to the mechanism for operating the bail II, L (see Figs. 2 and 4) is a stud on the outer side of bearing-plate A⁵, upon which turns a large toothed wheel M and a catch-lever N. The upper end of N is offset above M, so as to lie in the same plane with and rest against the arm of bail II. Projecting down from the arm of the bail II is trigger-lever h^3 , which lies between bearing-plate A⁵ and wheel M. On M are two studs m m' , the latter projecting on both sides of the wheel M. Fast in plate A⁵ is a cross-bar O, at each end of which is a coiled spring, one, P, being connected to N and the other, P', to H. A tooth b is set in winding-shaft B, so as to engage the teeth of wheel M and turn the same one tooth at each revolution of the shaft B.

The operation of the parts is as follows: While the machine is being wound up each revolution of the shaft B turns wheel M, through tooth b , one tooth forward in the direction indicated by the arrow. In the course of winding the inner end of the pin m strikes against the end of the trigger-lever h^3 and pushes it forward, moving it out of the way of the nose of the catch-lever N against a stop-pin a^5 on bearing-plate A⁵, thereby lifting bail H against the action of the spring P'. Spring P simultaneously pulls catch-lever N forward, so that its hook n engages with nose h^3 , thereby holding the bail in elevated position, so as to throw the reproducer and nut into operative positions. The stop-pin a^5 limits the play of the bail II and prevents the spring of the motor from being wound beyond the point desired. When the operator has finished winding and released

the handle of the winding, crank-wheel M is turned by shaft B in the opposite direction, and in the course of its revolutions the other pin m' strikes against the shoulder n' on catch-lever N, disengaging the catch-hook n from the nose h^3 on bail H, whereupon the latter, aided by spring P', falls, and thus lifts reproducer from the record and disengages the partial nut from the screw, thus permitting spring H' to pull the carriage back to its initial position. A leather washer G' may be used as a buffer to prevent shock when the spring thus returns the carriage. Further running of the machine is prevented by the inner end of pin m' bearing against stop-pin a^5 .

It will of course be understood that the various parts are so proportioned that during the time necessary to reproduce a complete record (while the reproducer is borne by the carriage from one end of the sound-record to the other) wheel M revolves just far enough to carry it from the position where m lies against h^3 to where m' strikes n' .

To prevent wrenching the parts or breaking a cog when the winding mechanism is locked or fully wound up, I provide a friction-clutch between the crank and winding-shaft. A barrel R is fitted to one end of the winding-shaft B by means of a slot therein engaging a pin r on the shaft and has fixed thereon the plates or disks R', while disks S, having prolongations that carry the handle T, are interposed between them, having only frictional engagement therewith, the amount of friction being controlled by the screw R². It will be understood that the frictional engagement is so regulated that there is no relative movement between the parts of the clutch during the normal winding action of the crank, but that when any unusual resistance is encountered, as when the spring is fully wound up or locked, the clutch slips, and thus prevents breakage.

Having thus described my invention, what I claim is—

1. In a coin-controlled graphophone the combination of a pivoted controlling-bar whose movements throw the reproducer into and out of operative position, a toothed wheel having a projecting lug engaging an arm on said controlling-bar at one point in the revolution of said wheel, whereby the bar is tilted to throw the reproducer into operative position, a stop limiting the throw of said bar, a winding-shaft having a tooth thereon engaging said toothed wheel, a ratchet-wheel on said shaft, a lug projecting therefrom, a pawl-lever having a nose on one end engaging said ratchet and the other end in proximity to a coin-chute, a pin on said pawl-lever, a pivoted lever engaging said pin and limiting the tilting movement of the pawl-lever and having a part depending in the path of the pin on the ratchet-wheel, substantially as described.

2. In a coin-controlled graphophone the combination of a driving-spring, a winding-shaft therefor, a ratchet-wheel thereon, a tilt-

ing coin-lever having a pawl-nose engaging said ratchet-wheel, a pivoted bar whose movements throw the reproducer of the graphophone into or out of operative position, means
 5 limiting the tilting movement of the bar in either direction, a toothed wheel having a projecting lug engaging a depending arm on said bar at one point in the revolution of said wheel, a catch holding said bar in position for
 10 the reproducer to operate, means on said toothed wheel tripping said catch before the wheel makes a complete revolution, a tooth on the winding-shaft engaging said toothed wheel, and means limiting the turning movement of said wheel in either direction, substantially as described.

3. In a coin-controlled graphophone the combination of a driving-spring, a winding-shaft therefor, a coin-operated lever controlling the winding movement thereof, a pivoted bar throwing the reproducer of the graphophone into and out of operative position, a catch for engaging and holding said bar in operative position, a toothed wheel having a
 25 lug for engaging an arm or lever on said bar to throw the latter into operative position, a lug on said wheel tripping said catch during the reverse revolution of the wheel, and a tooth on the winding-shaft engaging said
 30 wheel, substantially as described.

4. In a coin-controlled graphophone the combination of a winding-shaft, a pivoted bar throwing the reproducer of the graphophone into and out of operative position, a toothed

wheel having a lug engaging and throwing
 35 said bar into operative position during the winding, a catch engaging and retaining the bar in said position, a lug on said toothed wheel tripping said catch during the reverse
 40 movement of the wheel, and a tooth on the winding-shaft engaging said toothed wheel, substantially as described.

5. In a coin-controlled graphophone the combination of a driving-spring, a winding-shaft therefor, and coin-controlled devices
 45 normally locking the same against winding, with means limiting the winding and unwinding of the spring, a catch retaining the reproducer in operative position and means operated by the winding-shaft during its un-
 50 winding movement to trip said catch, substantially as described.

6. In a coin-controlled graphophone the combination of a driving-spring, a winding-shaft therefor, a ratchet-wheel on said shaft,
 55 a pawl-lever having one end in proximity to a coin-chute and a nose on the other end engaging said ratchet-wheel, a stop in position to limit the tilting action of the pawl-lever, and tripping means on the ratchet-wheel to
 60 free said lever, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

W. I. STARR,

R. IRWIN SMITH.

No. 622,379.

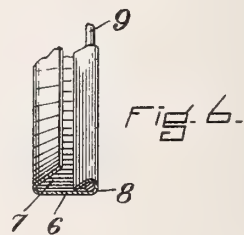
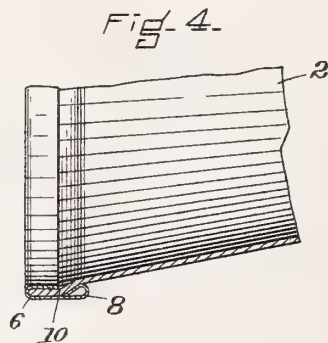
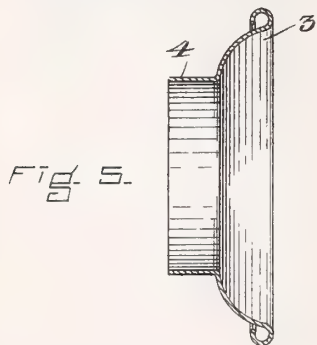
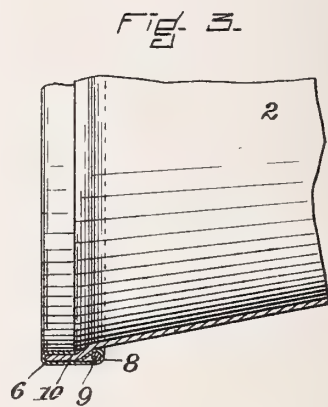
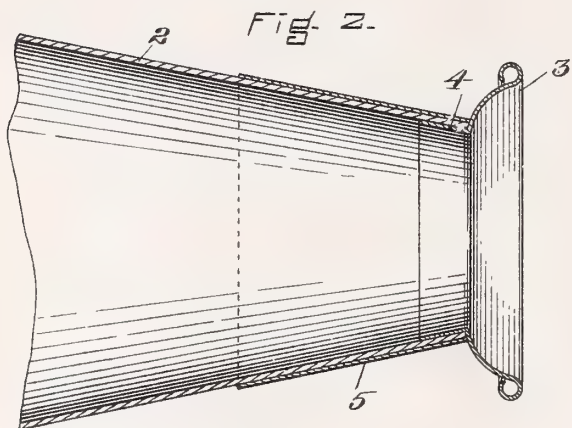
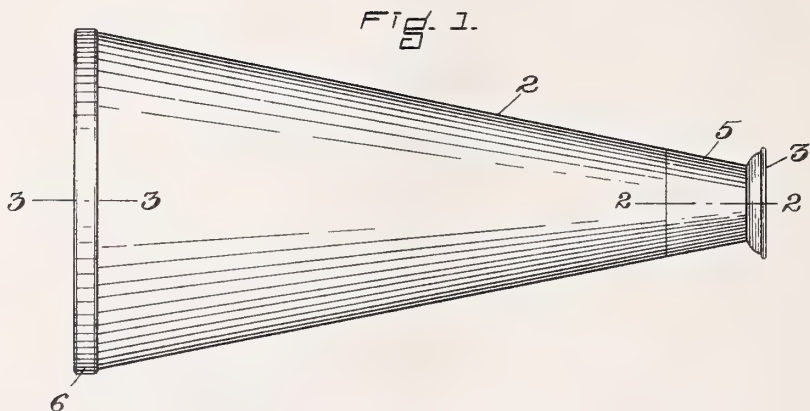
Patented Apr. 4, 1899.

E. B. MERRIMAN.

MEGAPHONE.

(Application filed Aug. 12, 1898.)

(No Model.)



WITNESSES.

A. D. Grover
Fred E. Dorr.

INVENTOR.

Edward B. Merriman,
By his attorney,
E. G. Chadwick.

UNITED STATES PATENT OFFICE.

EDWARD B. MERRIMAN, OF BOSTON, MASSACHUSETTS.

MEGAPHONE.

SPECIFICATION forming part of Letters Patent No. 622,379, dated April 4, 1899.

Application filed August 12, 1898. Serial No. 688,423. (No model.)

To all whom it may concern:

Be it known that I, EDWARD B. MERRIMAN, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Megaphones, of which the following is a specification.

My invention relates to megaphones, and more particularly to the mouthpiece and the rim thereof and the manner of attaching them to the two ends of the body portion or shell of the instrument. Heretofore it has been usual to secure these parts together by means of rivets or screws; but it has been found in practice that the slight projections formed on the inner surface of the body portion of the megaphone by the heads or ends of the rivets or screws are sufficient to impair the acoustic properties of the instrument, the interior of which should be as smooth and unbroken as possible in order to secure the best results in its use.

My present invention provides a megaphone which has its parts so constructed and united as to remedy the above defect and which at the same time is simple of construction and of great strength and durability.

A megaphone made in accordance with my invention is shown in the accompanying drawings, in which—

Figure 1 is a side elevation of the complete instrument. Fig. 2 is an enlarged section of the mouthpiece and adjacent parts, taken on the line 2 2 in Fig. 1. Fig. 3 is an enlarged section of the rim and adjacent parts, taken on the line 3 3 in Fig. 1. Fig. 4 is a view similar to Fig. 3, showing a slight modification. Fig. 5 is a central section of the mouthpiece proper; and Fig. 6 is a detail of the rim, showing these parts as they appear before they are secured to the body portion of the instrument.

The body portion of my megaphone consists of a conical tube 2 of the usual or any approved construction, it being ordinarily made of leather-board, chemical fiber board, or analogous material, although I have used metal for the purpose.

The mouthpiece proper consists of a cup-shaped portion 3, provided with a short tubular extension 4, which is made of metal of medium softness, preferably brass, and is

originally cylindrical, as shown in Fig. 5, and in conjunction with the above parts I provide a conical metallic tube 5, which is somewhat longer than the tubular extension 4 and is made of such size and taper that it will fit closely around the small end of the body portion 2. These parts are assembled by slipping the tube 5 over the small end of the body 2 and then inserting the tubular extension 4 within these parts, after which said extension 4 is expanded by suitable means to fit tightly against the inner surface of the body portion 2. This expansion is of course ultimately resisted by the tube 5, the result being that the body portion 2 is very tightly clamped and securely held between said tube 5 and the extension 4. As thus constructed and combined these parts are obviously incapable of separation without destroying one or more of them, and at the same time the inner surface of the megaphone is rendered smooth and free from any projections whatever. At the opposite or large end of the body portion of a megaphone it has been customary to attach a stiffening and strengthening rim of wood or metal. My improved rim 6 consists of a strip of metal folded lengthwise to provide a groove 7 for the reception of the edge of the body portion 2, and further provided with a bead 8 along its outer edge, which I prefer to form by turning the edge of the strip inward, as shown in Figs. 3, 4, and 6. I also prefer to insert a wire 9 within the small tube which forms the bead 8, thereby increasing the strength and stiffness of the rim; but this wire may be omitted if desired, as shown in Fig. 4, as the bead 8 itself greatly stiffens the rim. The rim 6 is secured to the body portion 2 by inserting the latter within the groove 7 and then forcing the inner portion of the rim outward against the inner surface of the body portion until the latter is firmly pressed against the outer portion of the rim and securely clamped in place. It will be seen that the outer portion of the rim is perpendicular, or approximately so, to its diameter, so that with respect to the taper of the body portion 2 a depression is formed between the bead 8 and the bottom of the groove 7, as indicated at 10, and the inner portion of the rim should be of such width as to reach about to the middle of said

depression, so that in the operation of securing the rim to the body portion the substance of the latter is forced by the inner edge of the rim into the depression, being bent slightly outward under the bead 8. In this manner a very firm union of these parts is secured.

My megaphone as above constructed is exceptionally strong for its weight and has a smooth finish on both its exterior and its interior, which improves its appearance as well as its acoustic qualities. It will be noted, also, that both the rim and the mouthpiece are firmly united to the body portion at every point of contact therewith instead of being united at isolated points only, as by rivets, so that said body portion cannot be forced either inward or outward away from the rim or mouthpiece at any point. Hence it results that it is practically impossible for the parts of the instrument to become separated from one another, thereby still further improving upon those prior megaphones which have their parts riveted or screwed together, in which the rivets or screws often work loose and have not infrequently been torn out of the shell under the rough usage to which these instruments are liable to be subjected.

I claim as my invention—

1. In a megaphone, the combination with a conical body portion of an external collar

fitted to the small end thereof, and a mouthpiece having a tubular extension inserted within said body portion and expanded tightly against the same.

2. In a megaphone, a rim for the large end thereof comprising a strip of sheet metal folded to form a groove for the reception of the edge of the megaphone and having its outer edge turned inward to form a strengthening-bead, thereby forming a depression beneath said bead, for the purpose set forth.

3. In a megaphone, the combination with the body portion 2 of the rim 6 provided with the groove 7 and bead 8, forming a depression 10 into which said body portion is forced by pressing outward the inner edge of said rim.

4. In a megaphone, the combination with the body portion 2 of the rim 6 provided with the groove 7 in which the edge of said body portion is clamped, said rim having also a bead 8 containing a wire 9.

In testimony whereof I have hereunto subscribed my name this 11th day of August, 1898.

EDWARD B. MERRIMAN.

Witnesses:

E. D. CHADWICK,

E. B. TOMLINSON.

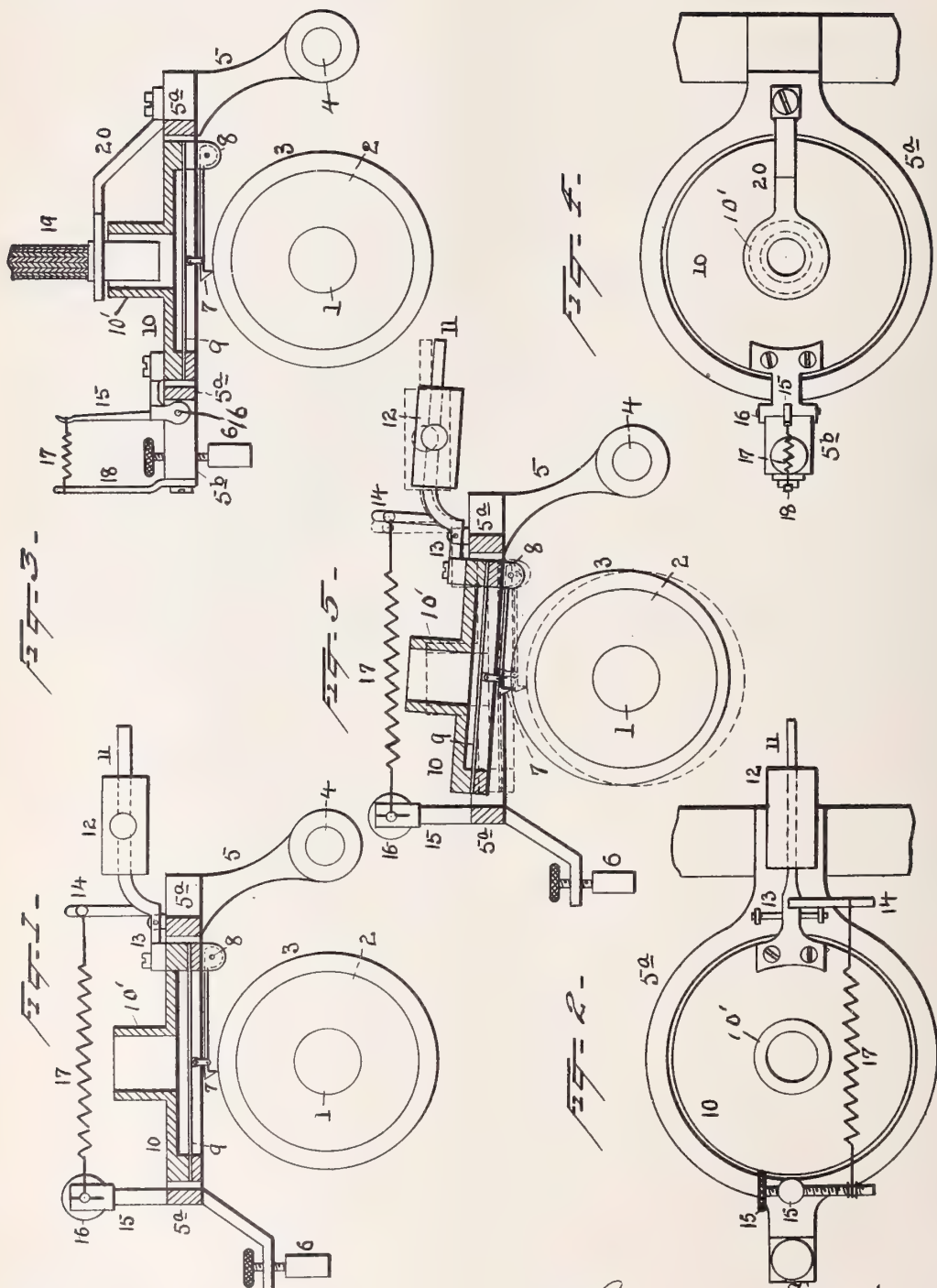
No. 622,843.

Patented Apr. 11, 1899.

**T. A. EDISON.
PHONOGRAPH.**

(Application filed Dec. 3, 1890.)

(No Model.)



Witnesses
Ivornis A. Clark
W. P. [unclear]

Thomas A Edison,
Inventor,
By his Attorneys
Jes & Seely

UNITED STATES PATENT OFFICE.

THOMAS A. ELISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 622,843, dated April 11, 1899.

Application filed December 3, 1890. Serial No. 373,407. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 889,) of which the following is a specification.

My invention relates to phonograph-recorders and reproducers; and it consists in means for enabling the recorder or reproducer to operate satisfactorily notwithstanding irregularities or eccentricities which are sometimes found in the surface of the phonogram-blanks owing to imperfections in their manufacture or to warping after manufacture.

The invention is based upon the disclosures of my caveat No. 111, (Official No. 147 10,308,) filed October 26, 1888.

In the accompanying drawings, Figure 1 is a sectional view and partial elevation of a phonograph embodying my invention. Fig. 2 is a top view of the same. Fig. 3 is a view similar to Fig. 1 of a modified form. Fig. 4 is a top view of the form shown in Fig. 3. Fig. 5 is a view similar to Fig. 1, illustrating in exaggerated form the bodily movements of the recorder or reproducer to compensate for eccentricities of the phonogram-blank.

Referring to Figs. 1, 2, and 5, 1 is the phonograph-shaft, 2 the phonograph-cylinder, and 3 the phonogram-blank.

4 is the guide-rod upon which the recorder or reproducer carrying arm 5 is mounted, so that such arm can be swung upon said rod to lift the recorder or reproducer off of the blank and so that said arm can be moved longitudinally on said rod by the feeding mechanism of the phonograph, as will be well understood. The carrying-arm 5 projects forward over the phonograph-cylinder and at its forward free end rests upon the guide-bar 6, upon which it slides in the operation of the phonograph. Its bearing on the guide-bar 6 may be made adjustable by means of a thumb-screw. Over the phonograph-cylinder the carrying-arm 5 is opened out into the form of a ring 5^a, in which the recorder or reproducer is pivoted, so that the recording or reproducing point will rest directly by the weight of the entire recorder or reproducer (counter-balanced so far as may be necessary) upon

the blank or record. The recorder or reproducer consequently has a floating action and rises and falls bodily to compensate for eccentricities of the blank, as illustrated in exaggerated form in Fig. 5, while the inertia of the recorder or reproducer is such that with respect to the minute elevations and depressions which constitute the sound-record its position is always fixed and the movements produced by the sound-waves in recording or by the sound-record in reproducing are communicated to the diaphragm and point without producing any bodily movement of the recorder or reproducer.

7 is the recording or reproducing point, shown as pivoted at 8 to the diaphragm-ring 10 and operatively connected with the diaphragm 9. Said diaphragm is mounted in the ring or frame 10 in the ordinary manner. The diaphragm-ring 10 is secured to the lever 11, which is pivoted at 13 to the carrying-arm. The lever 11 has an adjustable weight 12 upon it, which may be adjusted to balance more or less completely or actually over-balance the weight of the recorder or reproducer. To secure a finer adjustment, a spring 17 may be provided, extending from an arm 14 on the lever 11 to a post 15 on the ring 5^a of the carrying-arm 5. The spring 17 is capable of being adjusted by a thumb-screw 16, and the tension of that spring tends to throw the recorder or reproducer toward the surface of the blank or record.

In the modification shown in Figs. 3 and 4 the diaphragm-ring is secured to a lever 15, which is pivoted on the forward end or finger-piece 5^b of the carrying-arm. From this finger-piece rises the standard 18, to which the lever 15 is connected by means of the balancing-spring 17. In this instance the spring tends to lift the recorder or reproducer off of the surface of the blank or record, while the weight of the recorder or reproducer, which is not completely counterbalanced by the spring, causes the recording or reproducing point to engage with the blank or record. A speaking or listening tube 19 is supported by an arm or standard 20, which is mounted on the carrying-arm 5. The end of the tube 19, which enters the neck of the diaphragm-ring 10, is smaller in diameter than the opening in the neck. The speaking or listening tube 19 is

thus supported independently of the recorder or reproducer, so that the recorder or reproducer is not retarded in its movement by the weight of the tube. The tube 19 and its support are shown only in connection with Figs. 3 and 4; but it will be understood that the tube will be supported in the same manner for the form of recorder or reproducer shown in Figs. 1, 2, and 5.

10 What I claim is—

1. In a phonograph, the combination with the phonograph-cylinder, of a carrying-arm pivoted on a guide-rod in rear of the cylinder and projecting over the cylinder to a guide-rest in front thereof, and a recorder or reproducer pivotally supported by the carrying-arm and having the recording or reproducing point resting directly upon the blank or record, whereby the recorder or reproducer is

20 moved bodily by eccentricities in the blank or record surface, substantially as set forth.
2. In a phonograph, the combination with the phonograph-cylinder, of a carrying-arm pivoted on a guide-rod in rear of the cylinder and projecting over the cylinder to a guide-rest in front thereof, a recorder or reproducer pivotally supported by the carrying-arm and having the recording or reproducing point

resting directly upon the blank or record, whereby the recorder or reproducer is moved bodily by eccentricities in the blank or record surface, and balancing devices for counterbalancing the excessive weight of the recorder or reproducer, substantially as set forth.

3 In a phonograph, the combination with the phonograph-cylinder, of a carrying-arm pivotally supported on a guide-rod in rear of the cylinder and projecting over the cylinder and resting on a guide-rest at its forward free end, a recorder or reproducer pivotally supported by the carrying-arm and having the recording or reproducing point resting directly upon the blank or record, such recorder or reproducer moving bodily to compensate for eccentricities of the blank or record surface, and a speaking or listening tube supported independently of the recorder or reproducer so as not to interfere with its bodily movements, substantially as set forth.

This specification signed and witnessed this 1st day of December, 1890.

THOS. A. EDISON.

Witnesses:

JOHN F. RANDOLPH,
W. PELZER.

No. 624,059.

Patented May 2, 1899.

T. H. MACDONALD.
SOUND REPRODUCER FOR GRAPHOPHONES.

(Application filed June 5, 1897.)

(No Model.)

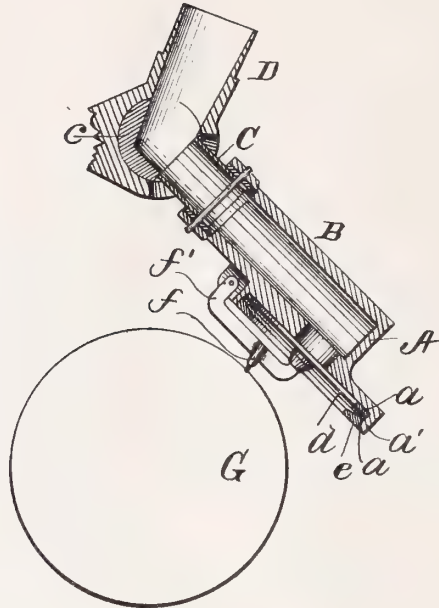


Fig. 1.

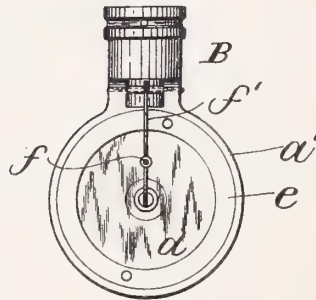


Fig. 2.

Witnesses.
W. R. Edlin,
R. W. Lewis.

Inventor.
Thomas H. Macdonald,
by J. L. Mauro,
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

SOUND-REPRODUCER FOR GRAPHOPHONES.

SPECIFICATION forming part of Letters Patent No. 624,059, dated May 2, 1899.

Application filed June 5, 1897. Serial No. 639,576. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in

5 Sound-Reproducers for Graphophones, which improvement is fully set forth in the following specification.

This invention relates to the construction of graphophone-reproducers of the general form illustrated in Patent No. 527,755, granted to me October 16, 1894. This reproducer consists of a tubular stem having on one end a circular chambered head in which the diaphragm is seated, the stylus being carried on an arm pivoted at one side of the head. The reproducer as a whole is connected to its support by a universal joint and rests by gravity upon the sound-record. It is essential that the instrument have perfect freedom of motion within certain limits in order that it may be automatically guided by the fine thread-like groove of the sound-record, and this essential condition is determined by the character of the connecting-joint, the weight of the reproducer as a whole, and the angle of inclination at which it operates. The character of the material of which the body and head of the reproducer are made has an important influence upon the operation of the reproducer in the reproduction of sounds, and very many materials have been tried for this purpose. The head of the reproducer has not only to perform the mechanical office of supporting the diaphragm, but its sonorous or resonant properties are liable to modify the character of the vibrations set up in the atmosphere. In operation it floats upon the tablet and is not rigidly held. Moreover, the reproducer as a whole must be sufficiently mobile to follow promptly the irregularities of the tablet without producing false vibrations of the diaphragm and sufficiently heavy to bear with the proper amount of pressure on the tablet. Heretofore the material which

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be compensated by lessening the angle of inclination, and it was found that the reproducer operated sluggishly and that the reproduction was inferior. I have found that a distinct improvement in the quality of the reproduced sound is secured by constructing the reproducer-head of aluminium. This is due in part to the lightness and other physical characteristics of the metal, which adapt it perfectly to the conditions found to be important in the operation of the floating reproducer. It is, however, due largely to the sonorous or resonant properties of the metal, on account of which I have found that the aluminium reproducer-head, while adjusting itself promptly and perfectly to the sound-record, preserves faithfully and transmits without distortion or addition of foreign vibrations the characteristic atmospheric vibrations corresponding to the recorded sounds. Furthermore, it is found that the reproduced sounds have a firmness and fineness of tone which have not been obtained with previous types of reproducer. As compared with the hard-rubber reproducer (with which the best results have been obtained prior to this invention) aluminium has not only lightness, which was one of the reasons that led to the use of rubber, but it has lightness combined with mass of metal, which has an important influence upon the quantity and quality of the tone. Furthermore, aluminium is not susceptible to atmospheric influences, and hence permanently maintains its form. It is much easier to assemble and holds the diaphragm in a perfectly level condition at all times without any cramp whatever. This is a very important consideration. There has always been found to be a great variation in the performance of different rubber reproducers though apparently identical in construction. A slight irregularity in the seat of the diaphragm, producing an imperceptible departure from a plane surface, would affect materially the production of the sounds. With the aluminium reproducer it is found that the results as to sonorous reproductions with different reproducers are practically uniform. Finally the improvement has the further advantage

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that the parts can be made perfectly interchangeable.

In the accompanying drawings, which form part of this specification, Figure 1 represents in vertical section a reproducer constructed in accordance with the invention. Fig. 2 is an elevation thereof.

The reproducer is composed of a chambered head A on the end of a tubular stem or body B, the latter being in operation swiveled to the tubular socket C, which is connected by a ball-and-socket joint *c* to the tubular sound-conveyer D. The diaphragm *d* (preferably of glass) is seated in the annular head A between two packing-rings *a a*, of rubber or other suitable material, and retained in place by a ring *e*, screw-threaded on its periphery for engagement with corresponding threads on the interior of a depending flange *a'* on head A. The stylus *f* is carried by an arm *f'*, and the reproducer as a whole rests by gravity upon the record-tablet G.

According to the present invention the head A and stem or body B of the reproducer are made of aluminium and preferably in one piece, though the benefits of the invention to

a partial extent may be obtained by forming the head alone of aluminium.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A graphophone sound-reproducer having a chambered head formed of aluminium and a diaphragm seated therein, substantially as described.

2. A sound-reproducer having a chambered head and a tubular stem or body formed of aluminium, and a diaphragm seated in the head, substantially as described.

3. A sound-reproducer loosely mounted and adapted to rest by gravity upon the record-tablet, said reproducer having a stem and chambered head of aluminium, and a diaphragm seated in said head, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

M. A. FOGO,

M. K. SPEAR.

No. 624,301.

Patented May 2, 1899.

C. G. CONN.
GRAPHOPHONE.

(Application filed June 1, 1898.)

(No Model.)

3 Sheets—Sheet 1.

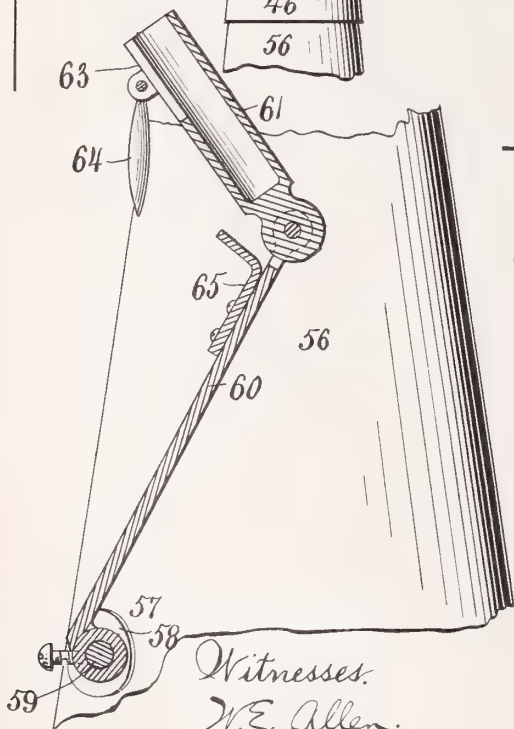
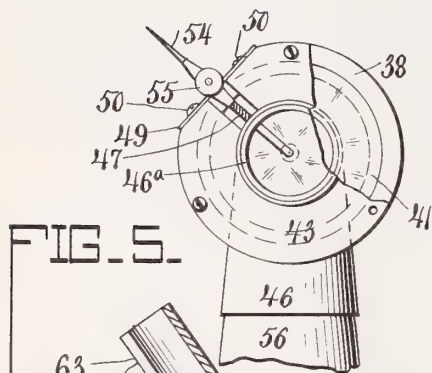
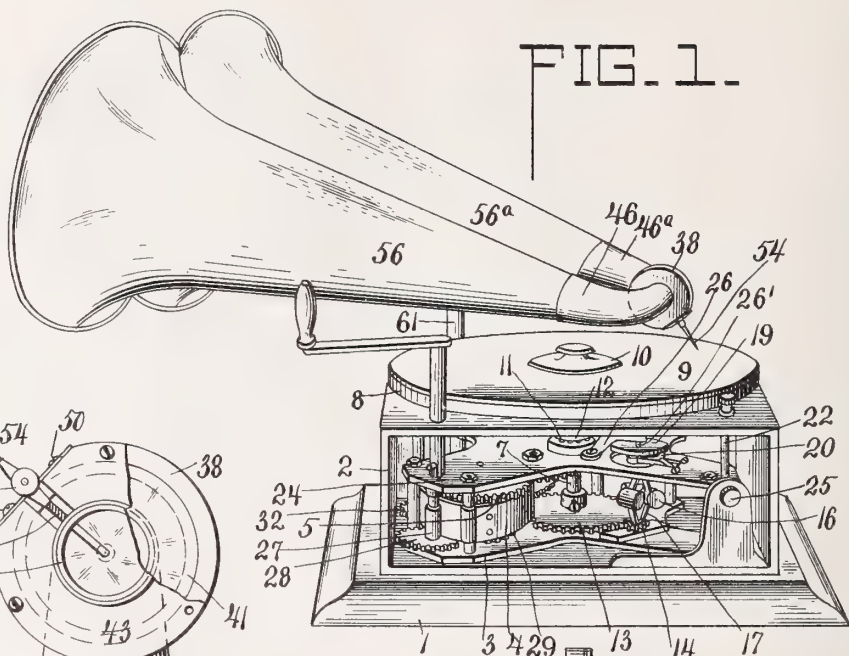
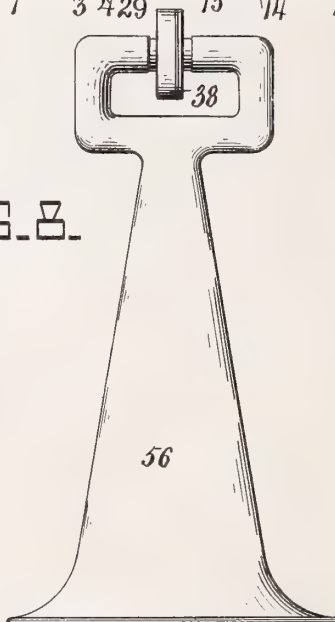


FIG. 8.



Inventor:
Chas. G. Conn.
By Edwin S. Jackson
Atty.

Witnesses:
W. E. Allen.
Katherine C. Manning.

C. G. CONN.
GRAPHOPHONE.

(Application filed June 1, 1898.)

(No Model.)

3 Sheets—Sheet 2..

FIG. 3.

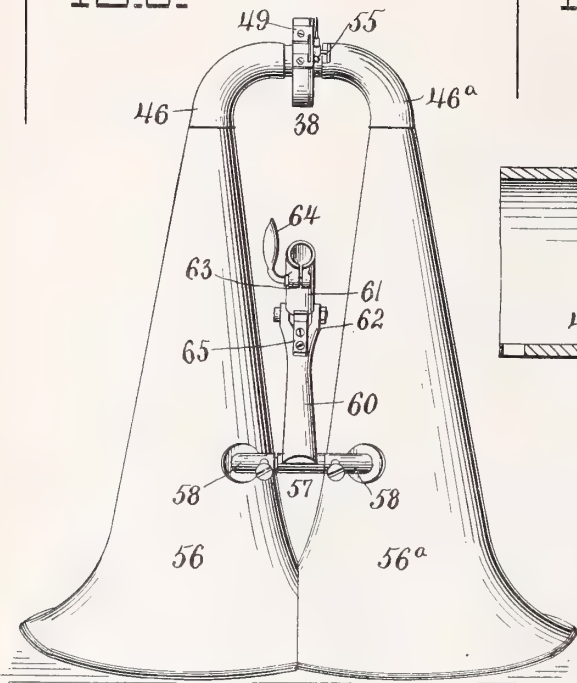


FIG. 6.

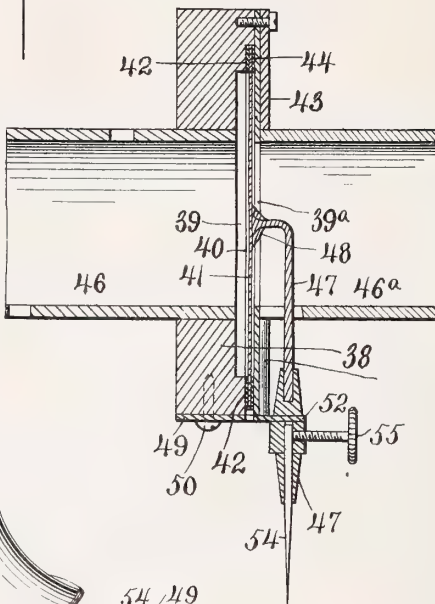


FIG. 9.

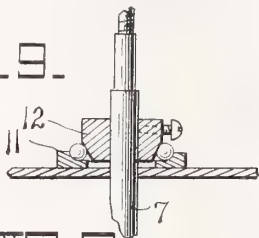


FIG. 2.

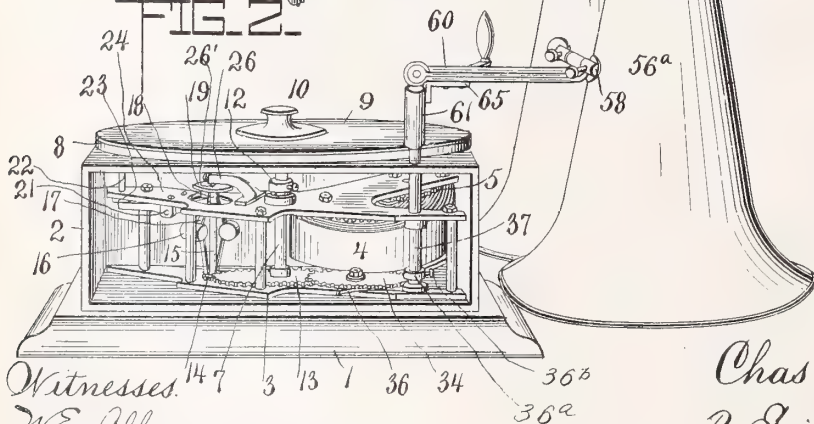
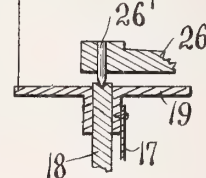


FIG. 10.



Witnesses:
W. E. Allen
Radwin C. Manning

Inventor:
Chas G. Conn.
By Edwin S. Jackson
Atty

C. G. CONN.
GRAPHOPHONE.

(Application filed June 1, 1898.)

(No Model.)

3 Sheets—Sheet 3.

FIG. 4.

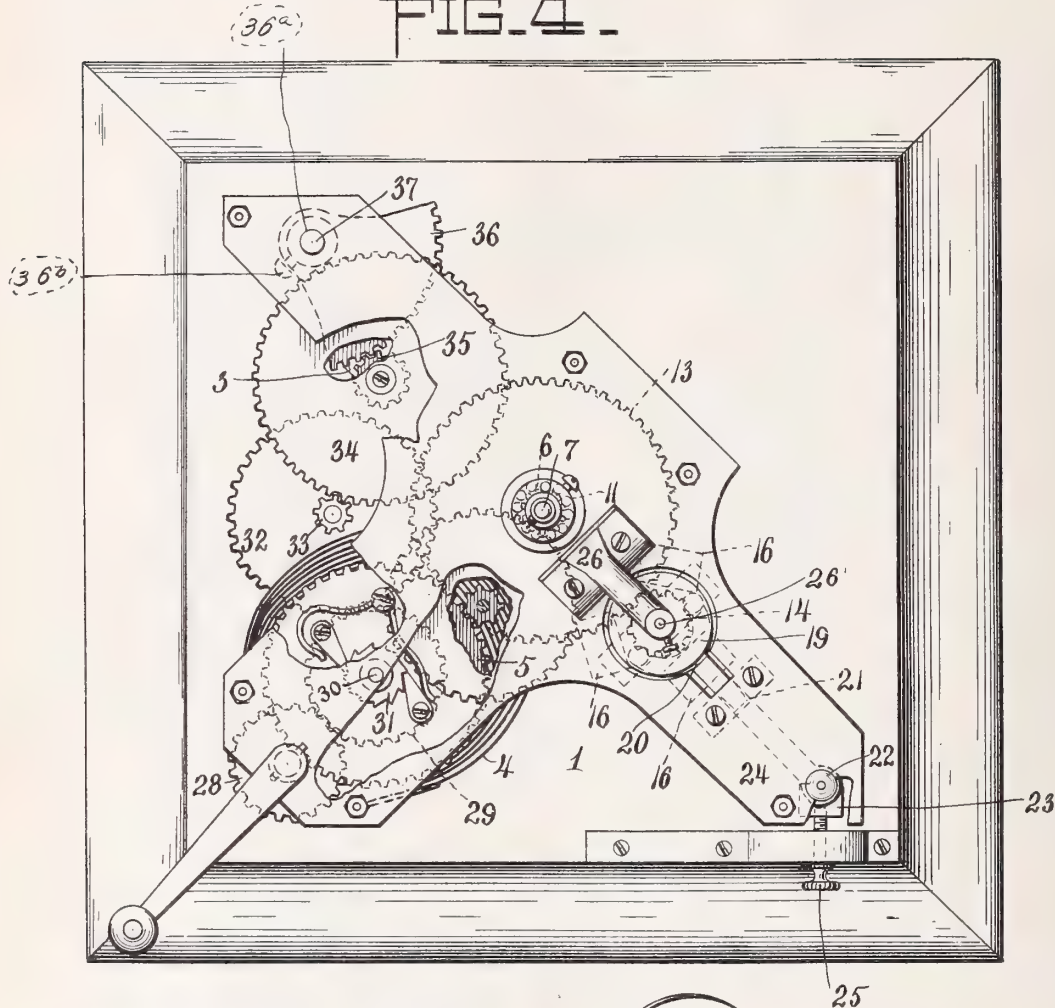
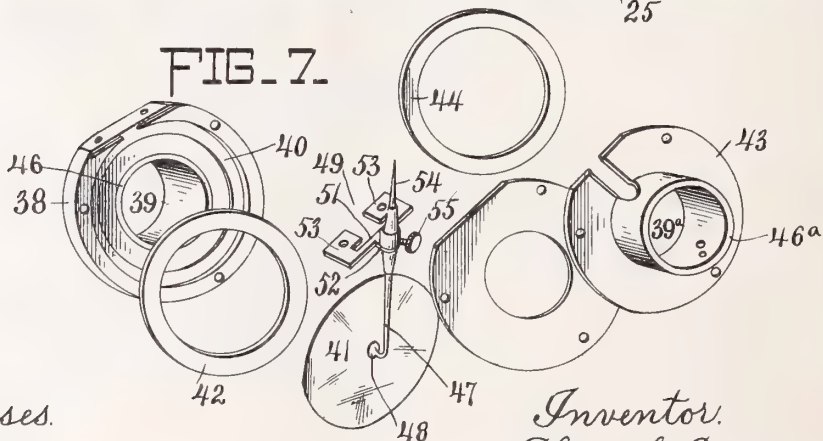


FIG. 7.



Witnesses.

N. E. Allen.

Richard E. Channing.

Inventor.
Chas. G. Conn.

By Edwin S. Clarkson
Att'y

UNITED STATES PATENT OFFICE.

CHARLES G. CONN, OF ELKHART, INDIANA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 624,301, dated May 2, 1899.

Application filed June 1, 1898. Serial No. 682,268. (No model.)

To all whom it may concern:

Be it known that I, CHARLES G. CONN, a citizen of the United States, and a resident of Elkhart, in the county of Elkhart and State of Indiana, have invented certain new and useful Improvements in Graphophones, of which the following is a specification.

My invention relates to that class of graphophones commonly called "gramophones," being designed more particularly for the purpose of producing or reproducing from sound-records upon flat rotary disks or platens; and my invention consists in certain novel features of construction, which will hereinafter be fully described, and particularly pointed out in the claims.

One object of my invention is to improve the driving mechanism, whereby it is better adapted to impart a constant speed to the rotating platen and permitting said plate to be regulated at will and to simultaneously impart to the recording or reproducing instrument a movement across the record corresponding accurately with the revolution of the platen in a manner that will retain the stylus in the proper position to form the spiral groove in recording or to retain the stylus in the grooves of the record when reproducing.

A further object is to provide a sound-box communicating with and delivering vibrations simultaneously from both sides of the diaphragm, whereby the quality and quantity of the produced tones are magnified twofold.

A further object is to provide a special form of amplifying-bell, whereby the sound is delivered from the opposite sides of the diaphragm to the best advantage, this object being attained by employing either a double or single bell, through which the sound is blended and delivered in a combined or unitary volume.

A further object relates to the use of the discharging-bell as an arm or mounting by which to support the sound-box over the mounting, by which it is fed across the record, and to provide simple and effective means for mounting these parts in their proper relations, whereby the stylus is properly fed during the operation of the machine, but may nevertheless be moved manually backward and forward over the record at will or lifted

away from the record when it is desired to remove the platen.

A further object is to improve the means for recording vibrations of the diaphragm or for reproducing in the diaphragm the record of such vibrations—that is to say, to provide an improved mounting for the stylus, whereby it is held in position with sufficient rigidity to insure its accurate retention in the groove of the record, but at the same time to allow it a vibration lateral to the line of feed and directly transverse to the diaphragm to be vibrated, or, in other words, in the direction of the vibration to be produced without the necessity of using intermediate levers or connections. This object is accomplished in the main by employing a torsion-spring before the stylus-bar, the same being preferably in the form of a plate projecting transversely from the stylus-bar and having a reduced portion to which the stylus-bar is connected, whereby the necessary resiliency is obtained.

The several objects of my invention, as well as the various novel features of construction instrumental to the carrying out of the several objects, will be fully understood upon reference to the accompanying drawings, in which—

Figure 1 is a perspective view of a complete machine constructed in accordance with my present invention, the parts being in the positions assumed during operation of the machine, the side of the inclosing box being removed to disclose the driving mechanism. Fig. 2 is a similar view from the opposite side, showing the mounting of the amplifying-bell, whereby it is permitted to fold up out of the way when it is desired to wind the machine or to exchange the platen. Fig. 3 is a similar view showing the amplifying-bell detached. Fig. 4 is a plan of the driving mechanism employed for imparting rotary movement to the platen and feeding the stylus across the record. Fig. 5 is a longitudinal section through the reproducing mechanism. Fig. 6 is a vertical axial section of the sound-box and the stylus. Fig. 7 is a perspective view showing the parts of the sound-box, stylus, and stylus-spring segregated.

Referring to Figs. 1, 2, and 4, 1 represents a

suitable base or bed upon which the machine is mounted, and 2 an inclosing case or housing for the machine. These parts may be of any suitable construction and arrangement or even omitted without affecting my invention. 3 is a bed-plate upon which the driving mechanism is mounted. Said mechanism consists of a driving-spring 4, carrying an upper driving-wheel 5, which is geared to the pinion 6 on the main spindle 7, which receives a plate 8 for the platen. The platen is represented at 9, and it may be secured in place by a bur or nut 10 on the upper end of spindle 7. The spindle is preferably provided with a ball-bearing 11, with an adjustable cone 12, whereby the accuracy of the spindle may be maintained for the obvious purpose of improving the quality of the work of the machine. At its lower end the spindle 7 carries a multiplying-wheel 13, which meshes with a pinion 14 on a governor-shaft 15. The governor-weights 16 have their spring 17 suitably connected with the hub 18 of friction-disk 19, while beneath the disk 19 there is mounted a brake-shoe 20 in such position that when the governor-balls 16 expand by abnormal speed of the motor the disk 19 will be drawn down upon the shoe 20 and the motor will be retarded by the resulting friction, so that the speed will be maintained at a uniform rate. The brake-shoe 20 is pivoted at 21 and receives at its outer end an adjusting-screw 22 for the purpose of changing the position of the shoe 20, and consequently the degree of expansion allowed in the governor-weights before the frictional retardation will result. The set-screw 22 thereby becomes the means of accurately adjusting the speed of the machine. In order to better fix the shoe 20 to its adjusted position, a wedge 23 extends between the outer arm of the brake-shoe 20 and the upper plate 24 of the motor, so that the arm of the brake-shoe may be clamped upon said wedge and the parts held firmly to adjustment. A set-screw 25, shouldered against the outer casing 2 of the machine and threaded into the wedge 23, affords a convenient means for adjusting the latter beneath the arm of the brake-shoe. The upper end of the governor-shaft 15 may be held in position by a pin-bearing 26' in a bracket 26.

By referring to Fig. 2 it will be seen that the spring-motor is wound by an arbor 27, carrying a winding-wheel 28, which meshes with a driving-wheel 29 on the lower end of winding-shaft 30, which carries the upper winding-wheel 5, already referred to. A dog and ratchet 31 may be provided between the spring-shaft and its driving-wheels in the usual manner. The lower driving-wheel 29 of the spring-motor meshes with a reducing-gear 32, the pinion 33 of which meshes with a second reducing-wheel 34, whose pinion 35 engages a segmental rack 36 upon a post 37. The gearing thus interposed between the

spring-shaft 30 and the post 37 is such that a rotary movement less than a revolution will be imparted to the post 37 at each time the motor is allowed to run. The driving mechanism between the spring and the post 37 bears a fixed and constant relation to mechanism existing between said spring-motor and the rotary spindle 7. Said spindle 7 and post 37 are thereby moved in a fixed ratio, and they are controlled by the same governor, so that the transverse or feeding movement of the stylus will always bear the proper relation to the record upon the platen at whatever rate the latter may be rotated. It will be also seen from the construction described that not only is the stylus fed across the record proportionately to the revolution of the latter, but the post is always returned to starting position by the act of winding the motor, so that the feed is always ready without requiring special attention of the operator to this part of the mechanism. The connection between the segment 36 and post 37 is made through the medium of the hub 36^a on the segment, in which the post 37 is inserted, and a binding-screw 36^b, which is threaded into the hub and impinges against the cylindrical face of the spindle. By this means the above-described driving and return movements may be imparted to the spindle through the segment; but at the same time the connection is a frictional one and it provides for slipping between these parts in the event that resistance is offered to the swinging movement of the stylus—such, for instance, as might arise from irregularities of the record. This slip connection also enables me to return the stylus to the starting-point for repeating without stopping the motor of the machine and rewinding when it is desired to repeat a record.

Having thus described means for producing a constant rotary movement to a record-platen as well as means for regulating the revolution thereof and simultaneously producing movement in the post which will swing the sound-record or reproducing mechanism across the record at a rate bearing an unchangeable relation to the rotation of the record, I will now proceed to describe the improved mechanism for recording and reproducing sound and which is adapted to be mounted upon the post.

38 represents the sound-box, which is preferably of solid-metal construction and provided with a recess 39, forming a sound-chamber on one side of the diaphragm, and with a ledge 40, that receives the diaphragm 41, with an interposed washer 42, while the outer plate 43, with an interposed washer 44, clamps said diaphragm upon the ledge 40 and forms a sound-chamber 39^a on the other side of said diaphragm. The diaphragm is thus held in the sound-box with sound-chambers on both sides of it, which receive vibrations from the diaphragm alike in quality and strength of tone. Communication with the respective sides of

the diaphragm is established through the tubes 46 46^a, carried, respectively, by the box 38 and a cap 43.

47 represents the stylus-bar, the upper end 5 of which is secured to the diaphragm at 48 in a manner well known in machines of this character, while said stylus-bar is supported by a peculiarly-formed spring-plate 49, attached to the lower side of the box 38 by screws 50. The construction of the spring-plate 49 is shown more clearly in Fig. 7, where- 10 in it will be seen it consists of a main bar 51, which forms a torsional spring and is attached by a laterally-protruding lug 52 to the stylus-bar 47, also attaching-ears 53, which receive the screws 50, by means of which the spring-plate is secured to the box. By having the intermediate portion of the plate 49 cut away or weakened an effective torsional stylus- 20 spring is provided, said spring also having ample rigidity to hold the stylus accurately as it is fed across the record-plate. I prefer to make the stylus 54 removable, and for that reason it is secured in the stylus-bar 47 by a set-screw 55, as shown. It will be seen that the stylus-bar and stylus extend transversely through the torsional spring-bar 51, and the vibration produced upon the end of the stylus 54 is transverse to the frame of the dia- 30 phragm, and consequently directly corresponds to the vibrations to be produced by the diaphragm without requiring the use of intermediate levers or connections involving joints, where a large part of the vibratory movement would necessarily be lost. 35

To render the doubly-acting diaphragm most effective, I employ a peculiar construction of double bell 56 56^a, the small ends of which are attached to the respective tubes 40 46 46^a, leading from the respective sides of the diaphragms. These bells are preferably united or blended at their discharge ends or are otherwise juxtapose, so as to make them discharge uniformly and in a single volume of twofold force the vibrations produced by the opposite sides of the diaphragm. This bell, however, need not necessarily be made double, as shown in Fig. 3. The sound-waves 45 from the two sides of the diaphragm can as well be conducted into a single bell (shown in Fig. 8) by employing suitable connections, and the result will be fully as satisfactory so far as the added volume of tone from the use of the two sides of the diaphragm is concerned. 50

A further advantage of using a bell, either single or double, as a part of the arm carrying the stylus, arises from the convenient support which it affords for the sound-box. To 60 adapt the bell to serve this purpose, it is provided with a cross-brace 57, made up of sockets 58, swivel-pin 59, and supporting-arm 60, swiveled upon said pin 59. The outer end of the arm 60 carries a socket 61, hinged 65 upon a pintle 62 to said arm and provided with a lower split end 63 with a clamping-screw 64. The socket 61 is constructed to fit

over the post 37 of the feeding mechanism, and it is clamped upon said post, through means of the screw 64, with sufficient pressure 70 to cause the bell and the sound-box carried by it to be fed transversely across the record as the post 37 turns. The friction may, however, be insufficient to prevent manual adjustment of the bell and the parts carried by it, when desirable, for the purpose of repeating a part of the record or adjusting the stylus in starting the machine. 75

65 represents a stop or angle brace carried by the arm 60 in a position to engage the socket 61 and support the arm 60 at the proper angle, so as to offer a fixed support at its outer end to the bell at the cross-brace 57. With the arm 60 thus fixed the bell then becomes hinged at a single point—namely, upon the pin 85 59. The location of the cross-brace 57 is such as to bear any desirable portion of the weight of the bell and to impose upon the stylus 54 only the necessary weight to cause it to take properly into the grooves of the record. 90

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. A reproducing mechanism for a graphophone, comprising a sound-box containing a 95 diaphragm, a stylus controlling the diaphragm and supported by and having a flexible connection with the sound-box, a double discharging-bell having independent inner ends connected with the sound-box on opposite 100 sides of the diaphragm, said bell projecting outwardly with its axes on opposite sides of and parallel to the vertical plane of the diaphragm and a support for the reproducing mechanism connected with the double bell at 105 a point distant from the sound-box, substantially as and for the purpose set forth.

2. In a graphophone, a double bell, the parts of which have substantially parallel axes, and independent inner ends and a sound-box 110 carried by said bell supported between its said inner ends and having a diaphragm dividing it into two chambers communicating with the respective ends of the bell, substantially as described. 115

3. In a graphophone the combination of a suitable motor, a platen-spindle driven by said motor, an oscillating post frictionally driven from said motor and receiving therefrom movement bearing a fixed relation to the platen and spindle in one direction as the motor rotates the spindle in running down and in the opposite direction as the motor is wound up, a record-plate suitably mounted upon said spindle and a sound-box and stylus 120 suitably mounted upon said oscillating post, substantially as and for the purposes set forth. 125

4. In combination with a motor, a spindle driven positively by said motor, an oscillating post frictionally connected with a seg- 130 mental rack, gear-wheels positively connecting said segmental rack with the motor and arranged to impart a restricted movement thereto in opposite directions corresponding

to the running down and the winding up of the motor, a record-plate suitably mounted upon the spindle and a sound producing or recording device mounted upon said post, substantially as and for the purposes set forth.

5 5. In a graphophone, the combination of suitable driving mechanism, a governor-shaft connected with said driving mechanism, a friction-disk carried by said governor-shaft, 10 a pivoted brake-shoe secured adjacent to said friction-disk, an adjusting-screw controlling said brake-shoe, a wedge interposed between the brake-shoe and a fixed part to permit the brake-shoe to be clamped in position, and an 15 adjusting-screw for said wedge, substantially as and for the purposes set forth.

6. In a graphophone, the combination of the sound-box 38 formed with a recess 39 and with a ledge 40, the diaphragm 41 mounted upon 20 the ledge 40, the cap-plate 43 secured over said diaphragm with an interposed packing 44, and the oppositely-projecting tubes 46, 46^a, carried respectively by the box 38 and plate 43, substantially as and for the purposes set forth.

25 7. In a graphophone, a double bell, a sound-box connected to and carried by the inner ends of said bell.

8. In a graphophone, the combination with a double bell, of a sound-box entirely supported and carried by the bell, thereby connecting the inner ends of said bell. 30

9. In a graphophone, the combination with a double bell, a sound-box connecting the inner ends of the same, and a swivel-support for the bell adapted to be attached to the motor of the machine, substantially as described. 35

10. In a graphophone, the combination of a sound-box carrying recording or reproducing means, a double collecting or amplifying bell 40 having independent inner ends to which opposite sides of said sound-box are rigidly attached and by which it is supported, and a pivotal mounting for said bell, substantially as and for the purposes set forth.

45 11. In a graphophone, the combination of a sound-box containing a diaphragm dividing

the same into two sound-chambers and a collecting or amplifying bell formed in two parts having inner ends connected to and supporting the sound-box and with blended or united 50 outer ends, substantially as and for the purposes set forth.

12. In combination with the collecting or amplifying bell, the supporting-arm 60 swiveled at one end to said bell and having hinged 55 to its other end a socket by which the arm and bell may be mounted in position, substantially as set forth.

13. In combination with the two-part bell, the cross-brace 57 secured between the parts 60 of said bell, the supporting-arm 60 having swiveled connection with the bell through said cross-brace and the socket carried by the inner end of said arm, substantially as herein explained. 65

14. In a graphophone-bell, the combination of the supporting-arm 60 connected to said bell, the attaching-socket 61 and the angle-brace 65 secured to one of said parts and bearing against the other for the purpose of maintaining their angle and offering rigid support for the one upon the other, substantially as herein explained. 70

15. In combination with the post 37, the socket 61 having a split lower end provided 75 with a clamping-screw 64, the supporting-arm 60 attached to said socket, and supported through it, upon the post, and the bell supported by said arm 60, substantially as and for the purposes set forth. 80

16. In a graphophone, the combination of the sound-box containing a diaphragm, the stylus secured at one end to the diaphragm and the herein-described torsion-spring 49 comprising a bar 51 having a lateral attaching-lug 52 which receives the stylus and having ears 53 by which it is secured in place, substantially as and for the purposes set forth. 85

CHARLES G. CONN.

Witnesses:

HARRY S. CHESTER,
W. J. GRONERT.

No. 624,625.

Patented May 9, 1899.

A. C. CLARK & E. R. JOHNSON.
SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Jan. 9, 1897.)

(No Model.)

Fig. 1.

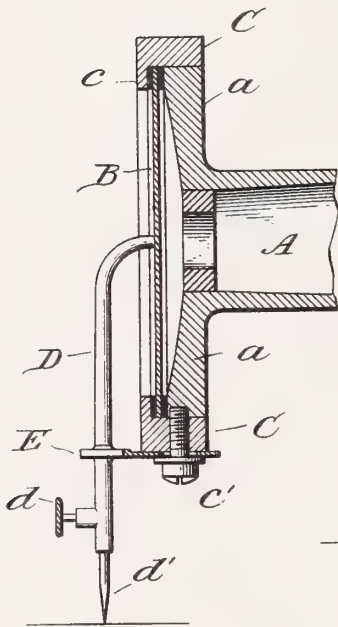


Fig. 2.

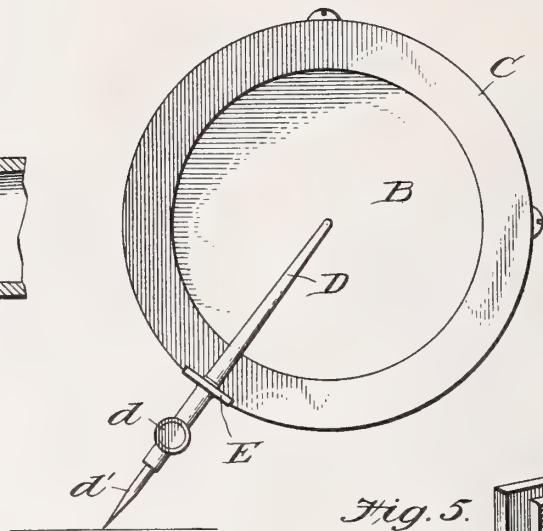


Fig. 3.

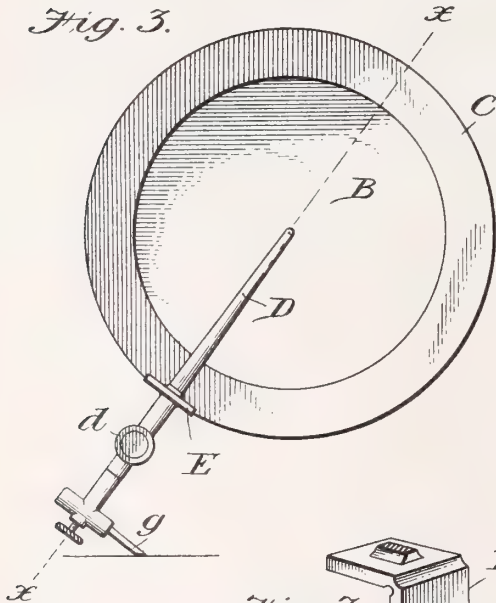


Fig. 4.

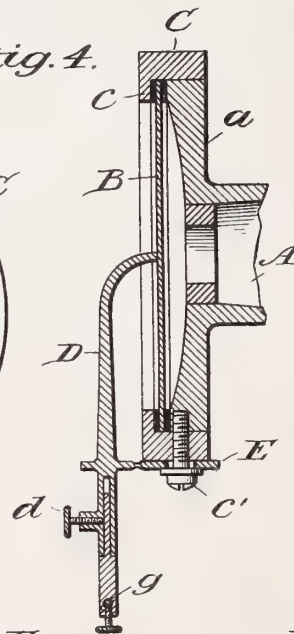


Fig. 5.

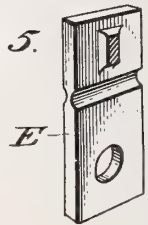


Fig. 6.

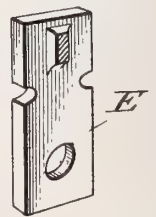
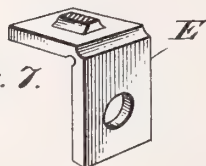


Fig. 7.



Witnesses,
J. T. Cross
J. Henderson

Inventors,
Eldridge R. Johnson and
Alfred Corning Clark,
by I. M. Peters,
their Attorney.

UNITED STATES PATENT OFFICE.

ALFRED CORNING CLARK, OF NEW YORK, N. Y., AND ELDRIDGE R. JOHNSON,
OF CAMDEN, NEW JERSEY.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 624,625, dated May 9, 1899.

Application filed January 9, 1897. Serial No. 618,539. (No model.)

To all whom it may concern:

Be it known that we, ALFRED CORNING CLARK, a resident of the city of New York, State of New York, and ELDRIDGE R. JOHNSON, a resident of the city of Camden, State of New Jersey, citizens of the United States, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

Our invention has relation to and has for its object to provide a construction for producing clearer records and for reproducing the sounds from the records in clearer and more distinct tones than in constructions heretofore known.

Our invention consists in the devices hereinafter particularly described and claimed.

In the accompanying drawings, Figure 1 represents a construction embodying our invention, partially in longitudinal section. Fig. 2 is a face view of the same. Fig. 3 is a face view of a construction embodying our invention with a cutting-tool adapted for record-making purposes. Fig. 4 is a sectional view of the same on the lines *xx*, Fig. 3. Figs. 5, 6, and 7 are enlarged detail views of preferred forms of plates for supporting and securing the needle-bar in position upon the diaphragm-frame.

Referring to the drawings, A is the tubular section of the diaphragm support or frame, having the disk-shaped shoulder *a*, preferably slightly concaved on its outer face, and adapted to receive and hold the diaphragm B in the position shown in the drawings through the medium of a flanged ring C, provided on the circumference of the disk-shaped shoulder *a*, the edge of the diaphragm B being secured in place by the flange *c* of the ring C against the outer edge of the shoulder *a*. We preferably provide, as usual, a small rubber ring on each side of the diaphragm, at its outer edge, at the point of contact when secured in position by the flange *c*. The ring C is held in position upon the shoulder of the frame A by a screw *c'* or by other suitable means. The needle-bar or stylus D is supported upon the

diaphragm-frame in such a manner that the opposite ends may be free, one end to come in contact directly or indirectly with the outer face of the diaphragm B at or near its central portion and the other end to engage upon the recording-surface for record making or reproducing purposes. At a point preferably about midway between the upper end of the stylus-bar and the recording-point (though the location may be varied at will) we provide a supporting-plate E, adapted to yield slightly under the vibrations caused in recording or reproducing the sound-waves. The plate E is secured to the diaphragm-casing in a desirable manner at any desirable point, as at the point shown in Fig. 1. As shown in Fig. 1, the orifice in the plate E through which the screw *c'* passes is enlarged and of greater area than the diameter of the screw. This is to allow of adjustment of the plate E at the point of support to regulate the length of the free or outwardly-extending portion of the supporting-plate E. The said plate E is constructed so as to yield slightly to the vibrations of the stylus-bar, and in order to regulate the sensitiveness of the said plate E to the desired degree we preferably groove it on either or both faces, as illustrated in Fig. 5 or Fig. 6, or, as illustrated in Fig. 7, at a point in the free end, as therein shown, though these grooves are not essential to our invention, as the supporting-plate E may be reduced to a uniform thickness throughout and adapted to yield and accomplish the desired results, as illustrated in Fig. 1.

The supporting-plate E, as stated, is adapted to yield slightly to the vibration of the stylus-bar and is in the nature of a stiff spring. It is so constructed and tensioned that although yielding slightly the resistance is sufficient to overcome the tendency of the stylus-bar to too great momentum and vibration, and it thus acts as a damper or check upon the needle-bar and is practically rigid to resist strain brought to bear against it in a lateral or sidewise direction.

The stylus-bar D at its lower end is preferably longitudinally bored and provided with a thumb-screw *d* for the reception and securing of a removable needle-point *d'* or cutting-

tool. The points of the needles are apt to wear and must be occasionally removed for sharpening and replacing. It is apparent that in this construction the length of the

5 lower arm of the stylus-bar may thus be varied, so that, considering the supporting-plate E as the fulcrum, by the lengthening or shortening of the lower arm by means of the adjustable needle d' and the thumb-screw d the
10 length of the vibration of the upper end of the stylus-bar caused by the pulsations of the diaphragm may be increased or diminished at the lower point of the needle in recording or reproducing, so, as a result, to modify the intensity of the sound in reproducing.

In the construction shown in Fig. 1 the upper end of the stylus-bar D is simply turned inwardly to come in contact with the diaphragm at the desired point, though other
20 forms of connection with the diaphragm may be employed.

In Fig. 7 the stylus-bar support is formed at an angle, the upwardly-extending portion being secured to the stylus-bar parallel therewith.

In Figs. 3 and 4 we illustrate a modified construction of cutting-tool holder provided at the lower end of the stylus-bar, forming a substantially T-shaped end, the cutting-tool
30 g being secured by a thumb-screw in the cross-section which is bored for its reception. This cutting-tool g is of the ordinary construction of a cutting-tool adapted in producing records upon the record-plates to remove the
35 material in the form of a shaving where the material is desired to be removed.

Our invention is adapted to sound recording and reproducing machines where the records are made upon rotating disks or revolving
40 cylinders and the original sound reproduced therefrom, and is not limited to any particular pattern of machine.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, a stylus adjustable in its length comprising a main bar and removable point-section, the point portion being adapted to telescope within the main bar, means for securing the two parts together in their adjusted position, the upper end of the main bar being phonetically connected with the diaphragm of the sound-box, and an adjustable spring-plate secured to the said stylus-bar intermediate in the length thereof carrying said stylus and tensioned to properly yield to the sound-vibrations, said spring-plate being adjustable lengthwise and means for securing the plate in position, substantially as described.

2. A yielding stylus-bar support for sound recording and reproducing machines, comprising a metallic spring-plate adapted to be secured at its opposite ends to a fixed point
65 and to the stylus-bar respectively, means for adjusting the said plate lengthwise, said plate having its cross-sectional area reduced at

about midway of its length to such an extent as to give to the spring its proper stiffness, substantially as described.

3. In a sound recording and reproducing machine, a stylus-bar, a yielding support for the same rigidly attached at one end to the stylus-bar intermediate in the length thereof having provided near the opposite or secured end of the yielding support an enlarged orifice, a securing screw or pin adapted to be passed therethrough of a diameter less than the diameter of the said orifice to provide for a forward and backward adjustment of the yielding support to regulate the length of the free or outer portion of the same extending beyond the point of attachment to the frame of the machine, said yielding support having its cross-sectional area reduced about midway
85 of its length, substantially as described.

4. In a sound recording and reproducing machine, a stylus-bar, D, formed inwardly at its upper end, to the diaphragm, the lower end of said bar, D, being longitudinally bored, a needle-point adapted to said bore, a thumb-screw, d , provided in the lower end of the bar, D, for securing the said point adjustably therein to regulate the combined length of the point and bar to allow the point to be readily adjusted or removed, a yielding plate, E, rigidly secured to the bar, D, at one end, and adjustably mounted upon the recording or reproducing frame to regulate the length of the free end of said yielding plate, E, and means for securing the said yielding plate upon the said frame, substantially as described.

5. In a sound recording and reproducing machine, a stylus-bar, D, having its upper end phonetically connected with the diaphragm, a longitudinally-disposed bore provided in the lower end thereof, and a needle-point adapted to said bore, a thumb-screw, d , provided in the lower end of said arm for securing the point adjustably therein, a securing-screw, c' , a yielding plate, E, rigidly secured at one end to the bar, D, an enlarged orifice provided in the opposite end of said plate, E, of greater area than the diameter of the securing-screw adapted to pass therethrough to allow of the said plate, E, being adjustably secured upon the frame of the machine to regulate to a nicety the length of the free end of the plate, said plate, E, having its cross-sectional area reduced at about midway of its length, substantially as described.

6. In a sound recording and reproducing machine, a spring-mounting for the stylus-bar adjustable lengthwise secured at one end to the stylus-bar and at its opposite end to the casing of the sound-box.

7. In combination with a sound recording and reproducing machine having a sound-box, diaphragm, a stylus-bar connected at its upper end with the said diaphragm, and a spring-supporting plate for securing the stylus-bar upon the sound-box said stylus-bar having a longitudinal orifice provided in the

lower end thereof, and thumb-screw provided
in said lower end, a T-shaped section for
holding the cutting-stylus adjustably secured
in said orifice in the lower end of the stylus-
5 bar through the medium of the said thumb-
screw, said T-shaped cutting-stylus section
having the lower cross member longitudinally
bored for the reception of the cutting-stylus,
a cutting-stylus, *g*, provided in said orifice
10 and thumb-screw adapted in said cross mem-

ber for securing the cutting-stylus in position, substantially as described.

In witness whereof we have hereunto set our hands this 8th day of January, A. D. 1897.

ALFRED CORNING CLARK.
ELDRIDGE R. JOHNSON.

Witnesses:

JNO. E. PARKER,
ELIAS H. WHITE.

No. 625,957.

Patented May 30, 1899.

T. S. PARVIN.
GRAMOPHONE.

(Application filed Dec. 20, 1897.)

(No Model.)

Fig. 1.

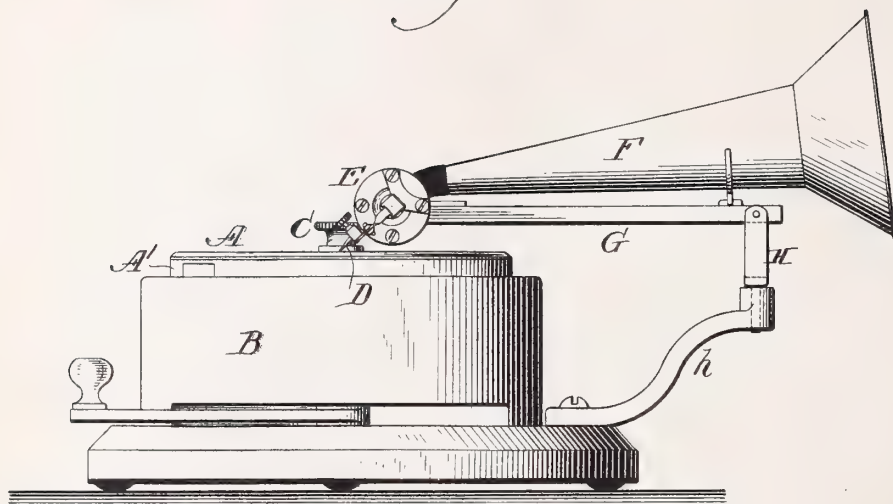


Fig. 2.

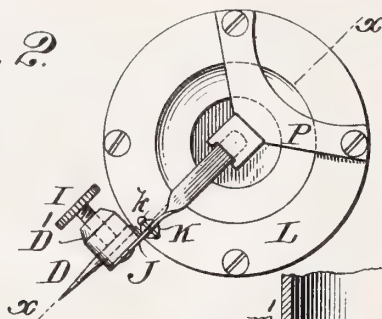


Fig. 3.

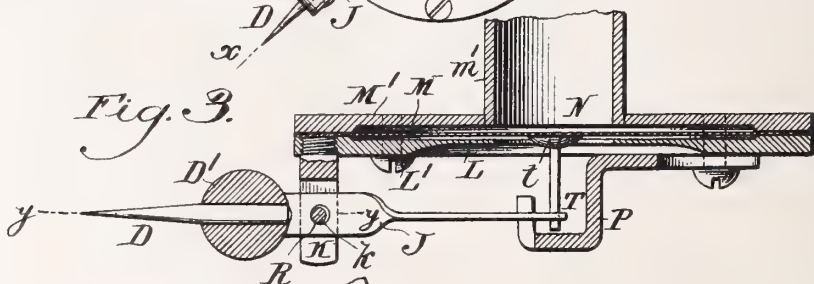
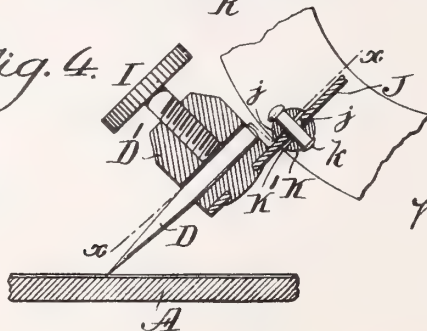


Fig. 4.



Witnesses.

Chas. Dwyer
C. M. Kelly.

Inventor.

Thomas S. Parvin
By his atty

J. M. Smith & Co.

Attorney.

UNITED STATES PATENT OFFICE.

THOMAS S. PARVIN, OF PHILADELPHIA, PENNSYLVANIA.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 625,957, dated May 30, 1899.

Application filed December 20, 1897. Serial No. 662,537. (No model.)

To all whom it may concern:

Be it known that I, THOMAS S. PARVIN, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Gramophones, of which the following is a specification.

My invention has reference to improvements in gramophones; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my invention is to provide a construction for sounding-boxes for producing vibrations of the air in accordance with the irregular grooves of the transmitting-plate which shall be exceedingly simple in construction, cheap to manufacture, and at the same time be exceedingly sensitive to the smallest variation in the grooves of the moving plate or disk containing the sound tracings or grooves. My construction is such that the smallest movement imparted to the needle or point is quickly transmitted to the diaphragm, causing it to respond with great rapidity and accuracy.

In carrying out my improvements I arrange a diaphragm between two plates of a sound-box constituted so as to form a thin air-space upon each side of the said diaphragm, one of said plates being formed with a sound-tube, to which the horn or ear-tube is connected by means of a piece of flexible tubing. The other of said plates of the sound-box is formed with a central aperture, through which a transmitting-pin extends from the diaphragm to the needle-carrying lever, which is jointed to the head with provision for universal movement and in such manner as to be free to move in all directions, but preferably with a tendency to centralizing itself when not under vibration. In this manner I am enabled to employ a transmitting structure between the moving plate and the diaphragm which shall be exceedingly sensitive and at the same time simple in construction and not liable to get out of order.

My invention will be better understood by reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a gramophone embodying my improvements. Fig. 2 is an

elevation of the sound-box. Fig. 3 is a sectional view on line *xx* of Fig. 2; and Fig. 4 is a sectional elevation on line *yy* of Fig. 3, showing the needle or point and its support.

A is the revolving disk or plate upon which the sound tracings or grooves are formed. This plate is clamped in position at C upon a suitable revolving plate A', driven by a power mechanism contained within the box B.

E is the sound-box and is carried on the end of a frame or arm G, connected by a universal joint H with a bracket or support *h*. The sound-box E is provided with a needle-point D, which rests in the grooves of the disk A and is vibrated laterally thereby for the purpose of imparting vibrations to the diaphragm M of the said sound-box. The sound-box is connected by a flexible tube with the horn or trumpet F, which is also sustained by the universal-jointed arm G. It is evident that in place of the horn ordinary ear-tubes may be employed.

I will now refer more particularly to the details of construction of the sound-box.

M' is a plate having the central aperture *m'*, which connects with the horn or trumpet F and from which the sound-waves are transmitted. The plate M' is provided with an annular offset to form a shallow air-space between the diaphragm M and the surface of said plate M'. The diaphragm is clamped between the rim of the plate M' and the rim of an annular plate L, also having a central aperture, and further provided with an annular offset to form a second shallow air-space L' upon the opposite side of the diaphragm. In this manner the diaphragm is free to vibrate except at its extreme rim, and by properly proportioning the air-spaces the clearness of the sound-waves transmitted is largely dependent. Secured to the annular plate L and projecting therefrom is a post K, having formed therein a radial or oblique slot K'. The post is so constructed that the sides of the slot preferably present one or more straight edges.

J is a pivoted bar preferably formed of a twisted piece of flat metal presenting two flattened surfaces at right angles to each other. One of these flattened surfaces loosely fits in the slot K' of the post K and, furthermore, is provided with an aperture R, through which a

pin *k*, carried by the post, extends, so as to loosely confine the lever *J* within the slot of the post. Also secured upon the outer end of the lever *J* is a clamp *D'*, containing a hole for receiving a needle-point *D* and also provided with a clamping-screw *I* for detachably holding the needle or point in the clamp. The other or inner end of the lever is provided with a pin *T*, which is preferably soldered or otherwise secured to the lever. The other end of the pin *T* is attached to the center of the diaphragm *M* in any suitable manner, but preferably by means of a wax joint *t*, since this enables a direct connection between the metal pin and diaphragm, but unites the two in a manner to constitute a more or less flexible joint. The diaphragm may be formed of this sheet metal, mica, celluloid, or other suitable material.

To prevent accidental detachment of the pin *T* from the diaphragm by any sudden jar on the needle, I provide a guard *P*, which is fastened by screws to the head and overhangs the end of the lever *J* immediately below the pin *T*. This construction gives sufficient clearance to permit the free movement of the lever *J*, but at the same time acts as an abutment thereto in case of accidental and excessive movement, so as to prevent any abnormal strain being put upon the wax joint, which might rupture it. While the lever *J* is shown as made fairly light, it is not necessarily flexible and is made in the particular shape shown on account of cheapness and lightness. It will be observed that as the lever *J* extends obliquely downward, as shown in Figs. 1, 2, and 4, it passes through the slot *K'* of the post *K* in such a manner as to rest against the two diagonally opposite edges *j j* of the slot, the said edges acting, in effect, as loose supports. The pin *k*, which acts as the pivot for holding the lever *J* in position, passes through the hole *R* in the lever *J*, which latter is of larger diameter. As the needle or point *D* is supported upon the plate *A*, it is seen that the pin rests upon the top curved edge of lower curved side of the aperture *R*, as indicated clearly in Figs. 3 and 4. The effect of this is to permit the most easy lateral oscillation of the lever *J*, since the contact of the pin *k* with said lever is upon a point or line. The friction, however, of the lever *J* upon the edges *j j* of the post acts as a damper to prevent undue vibration of the lever *J* and cause it to respond only to the action of the irregularities of the curves in the grooves of the plate *A*. It is thus seen that the lateral vibration of the lever *J* is amply provided for and that the size of the aperture *R* being in excess of the diameter of the pin *K* and the junction *t* with the diaphragm being formed of a flexible material, such as wax, the free movement of the diaphragm is permitted under the action of the needle in every direction without binding upon the lever *J*. In view of this freedom of movement without loose-

ness in operation the instrument is exceedingly sensitive and responds to the finest irregularities in the tracings on the revolving disk.

While I prefer the construction shown, I do not limit myself to the minor details thereof, as these may be modified without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a gramophone sound-box, the combination of a diaphragm, a box inclosing said diaphragm and supporting it with provision for vibration, a lever connected at one end with the center of the diaphragm by a cemented joint and at the other end provided with a clamp, a loose pivoted connection wholly of metal between the sound-box and the lever intermediate of its ends, a detachable needle or point held in the clamp, and an abutment secured to the sound-box extending over the end of the lever adjacent to the center of the diaphragm but without contact therewith to limit the possible vibration of said lever.

2. In a gramophone, a sound-box consisting of a suspended box structure containing a diaphragm free to vibrate, in combination with a post arranged near the periphery of the diaphragm and supported by the box provided with an oblique slot arranged at substantially right angles to the diaphragm, a transverse pin or pivot extending through the post and at right angles to the slot therein, a lever loosely arranged in the slot of the post so as to rest against diagonally opposite edges of the slot thereof and having an aperture through which the pin passes of considerably larger size than the pin to form a loose joint with contact at only one side of the pin and hole, a joint connection between one end of the lever and the center of the diaphragm, a clamp secured to the other end of the lever, and a needle or point held in said clamp, the construction being such that the weight of the sound-box is transmitted to the lever through the diametrically opposite edges of the slotted post.

3. In a gramophone, a sound-box consisting of a box structure containing a diaphragm free to vibrate, in combination with a post arranged near the periphery of the diaphragm and supported by the box provided with an oblique slot arranged at substantially right angles to the diaphragm, a transverse pin or pivot extending through the post and at right angles to the slot therein, a lever loosely arranged in the slot of the post and having an aperture through which the pin passes of considerably larger size than the pin to form a loose joint with contact at only one side of the pin and hole, a connection between one end of the lever and the center of the diaphragm, a clamp secured to the other end of the lever, a needle-point held in said clamp, and an abutment secured to the sound-box extending over the end of the lever adjacent to the

center of the diaphragm but without contact therewith except under abnormal movements of said lever whereby its possible vibration is restricted.

5 4. In a gramophone, the combination of a diaphragm, a suspended sound-box inclosing said diaphragm by annular walls, a slotted post extending from the sound-box near the periphery of the diaphragm, a lever arranged
10 obliquely to a horizontal plane carrying the weight of the sound-box and loosely pivoted in the slot of said post so as to put no torsional strain upon the diaphragm, a pivot-pin passing through the said post and lever
15 arranged substantially parallel to the plane of the diaphragm, a pin secured to the end of

the lever and extending toward the center of the diaphragm, a flexible connection between the end of said last-mentioned pin and the center of the diaphragm, a clamp secured to 20 the opposite end of the lever, a needle-point held in the clamp, and a sound-receiving tube opening from the sound-box on the side of the diaphragm opposite to its connection with the pivoted lever. 25

In testimony of which invention I hereunto set my hand.

THOS. S. PARVIN.

Witnesses:

EDWARD WINNEMORE,
HENRY K. SMITH.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

PROCESS OF MAKING GRAPHOPHONE-BLANKS.

SPECIFICATION forming part of Letters Patent No. 626,709, dated June 13, 1899.

Application filed August 23, 1898. Serial No. 689,351. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented a new and useful Improvement in Graphophone-Tablets and Processes of Manufacturing the Same, which improvement is fully set forth in the following specification.

My invention relates to the art of manufacturing blanks or tablets upon which sound-records may be cut or engraved, and more particularly to the process of treating the composition of matter of which the tablet is composed to the end that the same may be perfectly amorphous, free from all fibrous or other organic impurities, and without tendency to crystallization.

In forming a sound-record the method described in United States Patent No. 341,214 is now commonly employed, which method consists in cutting or engraving an undulatory groove in the surface of a suitable tablet by means of a cutting-style attached to a vibratory diaphragm upon which the sounds to be recorded are allowed to impinge. The force of the sound-waves is very weak, and it is essential to the accomplishment of the best results that the surface of the tablet should be such as to enable the style to cut a smooth undulatory line whose undulations shall correspond exactly to those of the recorded sound-waves. If there is any crystalline formation or any tendency thereto in the surface of the material composing the tablet, the shaving removed by the style is liable to follow the line of cleavage of the crystal, thus offering variable resistance to the action of the style and producing a groove whose irregularities do not correspond exactly to the undulations of the recorded sound-waves. It is also very important that the composition of matter composing the tablet should be free from all fibrous or other organic matter, as such offers uneven resistance to the cutting action of the style, causing it to form a rough and inaccurate record. In some cases the style rides over the fiber and makes no record at all, causing what is known as "blind spots." In other cases the style fails to cut the fiber, but pulls it out bodily, leaving a hole or depression where there should have

been a smooth cut. Again, the style, instead of cutting the fiber or removing it bodily, tears through it, leaving rough jagged ends which when the rubbing-style of a reproducer rubs over them give a rough harsh quality to the reproduced sound. Moreover, the organic matter is liable to ferment and mildew, greatly lessening the value of the blank and destroying the record cut therein.

In my Patent No. 606,725, dated July 5, 1898, I have described and claimed a process for making blank tablets whereby a superior tablet may be produced which is to a large extent lacking in the objectionable features above described and upon which records of a high order of merit may be produced. I have found, however, that there is often a tendency to form crystals upon the surface of blanks made by such process, which tendency is due to the presence in the blank of the "water of crystallization." I have also learned that such tablets sometimes contain fibrous or other organic impurities, such as fine dust particles, which are at all times floating in the air and which the most vigilant care could not entirely exclude.

The object of the present invention is to produce a blank tablet which shall be without any tendency to crystallization and in which all fibrous matter shall be destroyed; and to this end the invention consists in subjecting the composition of matter which is to constitute the tablet to a degree of heat sufficient to entirely drive off all water of crystallization and entirely destroy all fibrous and other organic impurities in the composition of matter.

Heretofore in the treatment of the composition of matter of which the tablets were to be formed heat has been resorted to for the purpose of eliminating the water; but great care has been taken not to exceed a temperature of about 330° Fahrenheit for fear of "charring" the composition and thereby rendering it unfit for use as a tablet material. This temperature was not sufficient to entirely eliminate the water of crystallization and would not destroy fibrous and other organic matter. I have discovered, however, that the composition of matter may be advantageously subjected to a heat of from 450° to 475° Fahrenheit.

heit, and that by so doing the water of crystallization may be entirely eliminated and the fibrous and other organic impurities eliminated or disintegrated.

5 For the purpose of illustrating my invention and the best method known to me for putting the same into practice I will describe one composition of matter and the process of forming and treating the same preparatory to
10 molding it into tablet form.

Formula: Stearic acid, free from oleic acid and glycerin, four hundred and eight pounds; aluminic hydrate, seven pounds; caustic-soda lye, eighty-five pounds. To this is added for
15 the purpose of "tempering" paraffin, ozocerite, or similar material, seventy-two pounds. The caustic soda is incorporated in water until a lye of 37.5° Baumé is obtained, and this is heated to its boiling-point, about 242° Fahrenheit. The aluminic hydrate is added and is quickly taken up by the lye. The stearic
20 acid is melted and raised to about the same temperature, and the compound of lye and aluminium slowly added thereto. It will unite readily therewith. It is preferred to employ about the temperature indicated, as thereby the formation of the composition proceeds gradually and without violent ebullition. The temperature of the molten mass
25 is then raised to a point somewhere between 450° and 475° Fahrenheit. When the desired temperature has been reached, I allow the same to fall about 100° and then pour the mass into the molds in the usual manner. The fall
30 of the temperature may be conveniently secured by putting out the fire and allowing the mass to stand a few moments.

It is not, of course, essential that all the ingredients constituting the compound material should first be incorporated in the mixture before heating the same to the high temperature required to drive off the water of crystallization and destroy all organic matter, as the ingredients may, if it is found
40 advantageous, be heated separately to the high degree necessary, or partial combinations may be formed, these heated to a high degree, and then the partial combinations united to form the finished compound. I prefer, however,
45 to first incorporate and thoroughly unite all

the ingredients forming the compound and then raise the entire mass to the high degree of heat necessary to drive off the water of crystallization and disintegrate the fibers and similar impurities, as hereinbefore described. 55

Not only do the blanks thus produced stand extremes of heat and cold better without molding or cracking, but they give better results at all times on account of their being more nearly amorphous and homogeneous. 60

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In the process of making a sound-recording material, the improvement consisting in
65 partially saponifying stearic acid, and then heating the mass to a temperature of about 460° Fahrenheit, substantially as described.

2. In the process of making a sound-recording material, the improvement consisting in
70 mixing stearic acid with caustic-soda lye, and then heating the mass to about 460° Fahrenheit.

3. The improvement in the process of making sound-recording material which consists
75 in heating such material to about 460° Fahrenheit, then cooling the same down to about 360° Fahrenheit, and then molding the material into the desired shape, substantially as described.

4. The process of making a sound-recording material consisting in dissolving aluminium in soda-lye, adding the solution to stearic acid, and raising the temperature of the mass
80 to about 460° Fahrenheit, substantially as described.

5. The process of making a sound-recording material, said process consisting in adding to stearic acid soda-lye with which a metal has been united, the lye being in such quantity as to produce partial saponification, and heating the mixture to about 460° Fahrenheit, substantially as described. 90

In testimony whereof I have signed this specification in the presence of two subscribing witnesses. 95

THOMAS H. MACDONALD.

Witnesses:

HENRY A. HUBBELL,
E. W. SULHIE.

No. 628,544.

Patented July 11, 1899.

T. H. MACDONALD.

MACHINE FOR MAKING GRAPHOPHONE RECORDING STYLES.

(Application filed Oct. 31, 1898.)

(No Model.)

Fig. 2.

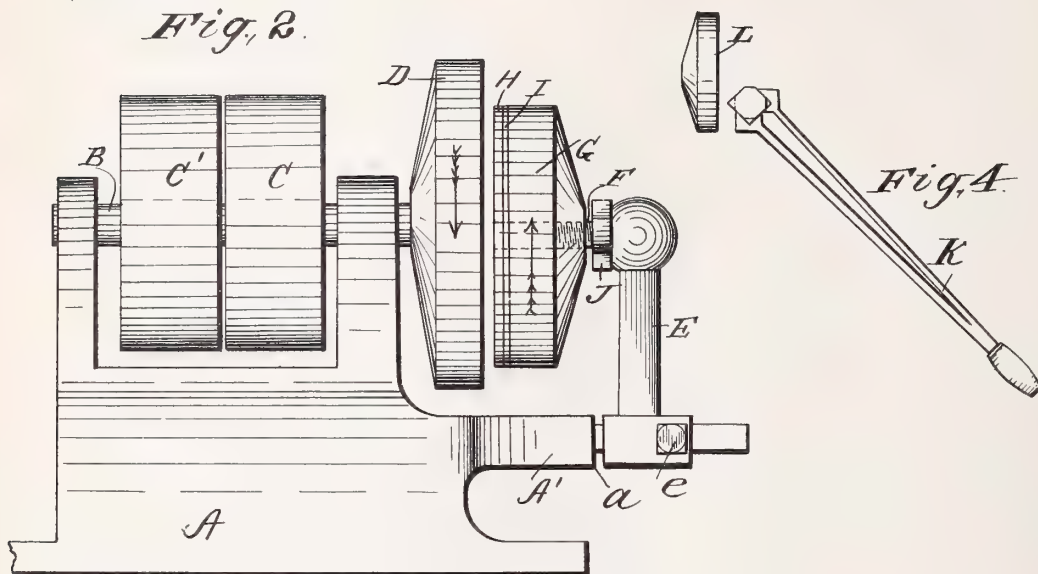


Fig. 1.

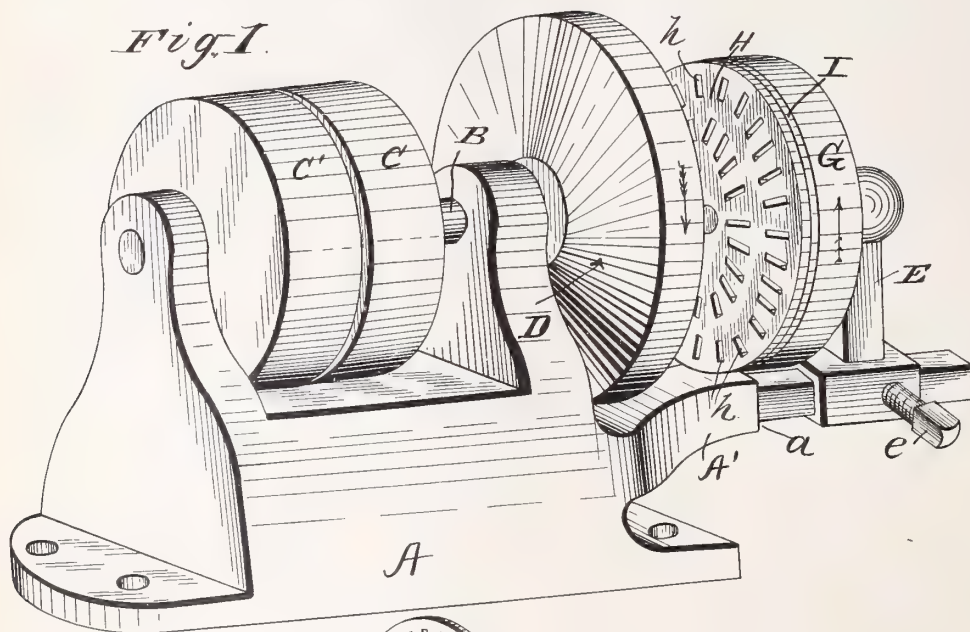
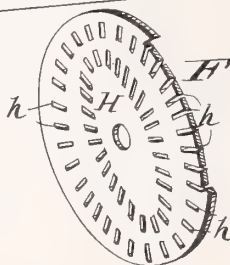


Fig. 3.



Witnesses.
W. R. Edgson.
H. W. L. L. L.

Inventor
Thomas H. MacDonald.
J. J. J. J. J.
his attorneys

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

MACHINE FOR MAKING GRAPHOPHONE RECORDING-STYLES.

SPECIFICATION forming part of Letters Patent No. 628,544, dated July 11, 1899.

Application filed October 31, 1898. Serial No. 695,047. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a resident of Bridgeport, Connecticut, have invented a new and useful Improvement in Machines for Making Graphophone Recording-Styles, which invention is fully set forth in the following specification.

My invention relates to the cutting-toll or "recording-stylus" of graphophones and the means employed for shaping or grinding the same to the proper form for use in connection with a recording-diaphragm.

The recording-stylus as commonly constructed is of sapphire and is cylindrical in form. Sapphires are produced in the shape of a rough mass of irregular form and are first cut into slabs of the proper thickness by means of gang-saws. The slabs are then cemented together and again presented to the gang-saws, the line of cut, however, being at right angles to the first cut. Upon dissolving the cement the sapphires are bound in the form of four-sided prisms of greater or less length and of a thickness equal to the proposed diameter of the stylus. These prisms are then cut or broken into suitable lengths, after which it is necessary that the angular prisms be reduced to cylinders and properly polished. Heretofore this has been accomplished by cementing one end of the prism into a chuck carried by a turning-lathe and holding a lap against it until it is reduced from a prismatic to a cylindrical form. Among the many objections and disadvantages incident to this manner of forming and polishing the cylinders are its tediousness and expense, the skilled labor required to accurately manipulate the lap to the end that a true cylinder might be formed and of the desired diameter, and the waste due to the fact that the end of the prism held in the chuck is not treated by the lap and has to be discarded.

The objects of the present invention are to produce means whereby a number of the prisms may be simultaneously, cheaply, and expeditiously converted into cylinders of the desired diameter and to avoid the waste incident to the old method by converting the prism throughout its entire length into a cylinder.

With these objects in view my invention consists in means whereby a number of prisms of approximately the length of the finished stylus may be simultaneously presented to the grinding action of a lap, combined with means for revolving the prisms about their longitudinal axes, whereby the angles of the prisms are submitted to the action of the lap and removed.

The invention further consists in certain details which will be hereinafter described and then pointed out in the claims.

In the accompanying drawings I have illustrated one of the many forms which my invention may assume, in which drawings—

Figure 1 is a perspective, and Fig. 2 a side elevation, of my machine. Fig. 3 is a face view of the prism-holder, and Fig. 4 shows the manner of using pincers for applying the square prisms to a lap to remove the more prominent angles.

In the drawings, in which like letters refer to like parts throughout, A is a suitable base or frame in which turns a shaft B, having thereon the fast driving-pulley C and the loose pulley C'. On a projecting end of the shaft B is a lap D, the body of which is preferably formed of copper and the front face of which is coated with diamond-dust or equivalent material for forming a grinding and polishing surface.

E is a standard adjustably secured on the projecting arm A' of the frame A. I have shown a set-screw e as a convenient means of securing the standard in its adjusted position.

F is a shaft secured in the standard E and projecting horizontally toward the face of the lap D, but with its axial line somewhat below that of the shaft B.

G is a wheel or disk, preferably of wood, mounted to turn freely on the shaft F, and of less diameter than the lap D. This disk G is revolved in a direction opposite to that of the lap D by any suitable mechanism—as, for example, a belt passing around the disk and extending to a driving-shaft.

H is a disk or carrier, preferably of red fiber, secured loosely on the shaft F opposite the face of the lap D, as shown, and I is a

thin disk of india-rubber or other suitable yielding material which is preferably placed between the carrier H and the disk G, though it may be omitted, if desired. The carrier H has a number of oblong slots *h* formed therein, each of these slots being of a proper size to receive a single prism. Means, such as a nut J, threaded on the shaft F, may be employed to adjust the position of the disk G relative to the lap D. Previous to placing the prisms in the slots *h* of the carrier H, I prefer to reduce the four-sided prisms to eight-sided prisms by grasping them in a pair of pincers K and applying them to a lap L, as shown in Fig. 4. This, however, is not necessary, and, if desired, the four-sided prisms may be placed directly in the carrier.

The operation is as follows: The prisms are placed in the slots *h* of the carrier H and the operator presses the standard E, so as to bring the prisms into contact with the face of the lap D, the disk G and the lap D being meanwhile revolved in opposite directions, the lap being preferably driven the faster. The effect of this action is that the disk G, carrying with it the yielding disk I, causes the prisms to turn over and over and the lap D grinds off their protruding angular edges, a certain amount of give in the disk I preventing any damage to the sapphires. After a few moments' treatment the prisms will be found to be reduced to cylinders of uniform diameter. A continuation of the treatment may be resorted to for polishing the cylinders. The gage or diameter of the cylinders is determined by the position of the nut J, and it may be adjusted to produce cylinders of greater or less diameter, as desired. By placing the shafts B and F with their axes in the same vertical but different horizontal planes practically the entire surface of the face of the lap is utilized in the grinding action and the wear upon the lap is even and uniform, whereas if the shafts B and F were placed with their axes in the same line the wear would be in circular grooves, which would very much shorten the life of the lap. After the sapphires have been reduced to cylindrical form they may be finished by "squaring" or "cupping" the ends as may be desired.

It will be understood that while the machine herein described is the construction which I prefer there may be numerous mechanical expressions of the inventive ideas embodied therein, and I do not therefore limit myself to the particular construction shown.

Having thus described my invention, what I claim as new is—

1. The combination of a lap, a frame supporting the same and means for revolving the lap, with means for presenting a plurality of angular articles to the face of the lap and means for revolving said articles about their longitudinal axes, substantially as described.

2. The combination of a lap, a frame supporting the same, and means for revolving the lap, with a carrier for presenting a plurality of prisms to the face of the lap, and means for turning the prisms in said carrier, substantially as described.

3. The combination of a lap, a frame supporting the same, and means for revolving the lap, with a carrier for presenting a plurality of prisms to the lap, means for automatically turning the prisms in the carrier and revolving the carrier, substantially as described.

4. The combination of a lap, and means for revolving the same, with a carrier for presenting a plurality of prisms to the face of the lap and means for revolving the carrier on an axis eccentric to the axis of the lap, substantially as described.

5. The combination of a lap, and means for revolving the same, with a disk revolving on an axis eccentric to said lap, a carrier turning loosely on the axis of the disk, the disk and carrier being movable to and from the face of the lap, substantially as described.

6. The combination of a lap, and means for revolving the same, with an adjustable disk revolving on an axis eccentric to said lap, a slotted carrier turning loosely in the axis of the disk, a slab of yielding material interposed between the disk and carrier and means for revolving the disk in the opposite direction from the lap, substantially as described.

7. The combination of a lap, and means for revolving the same, of a standard adjustable toward and from the face of the lap, a shaft projecting from said standard toward the lap, a disk revolving in said shaft and adjustable longitudinally thereof, a slotted carrier turning loosely on said shaft adjacent to the face of lap, a slab of yielding material interposed between the disk and carrier, and means for revolving the disk, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

WILLIAM I. STAU,
R. IRWIN SMITH.

No. 628,810.

Patented July 11, 1899.

H. JONES.

SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed June 11, 1898.)

(No Model.)

Fig. 1.

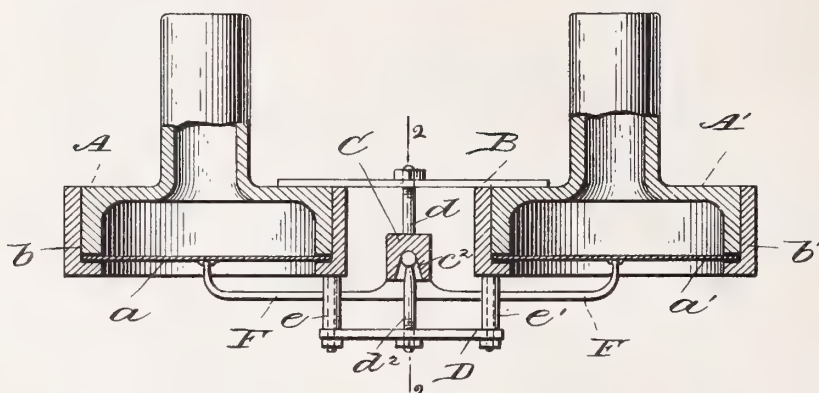


Fig. 2.

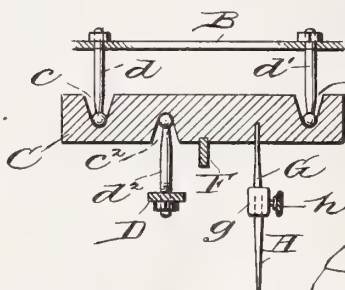


Fig. 3.

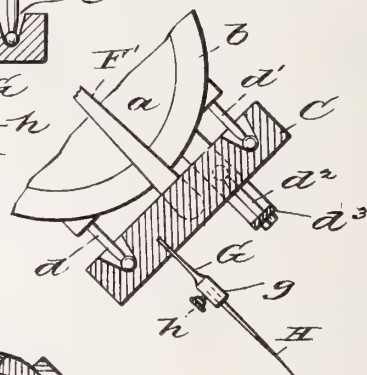


Fig. 5.

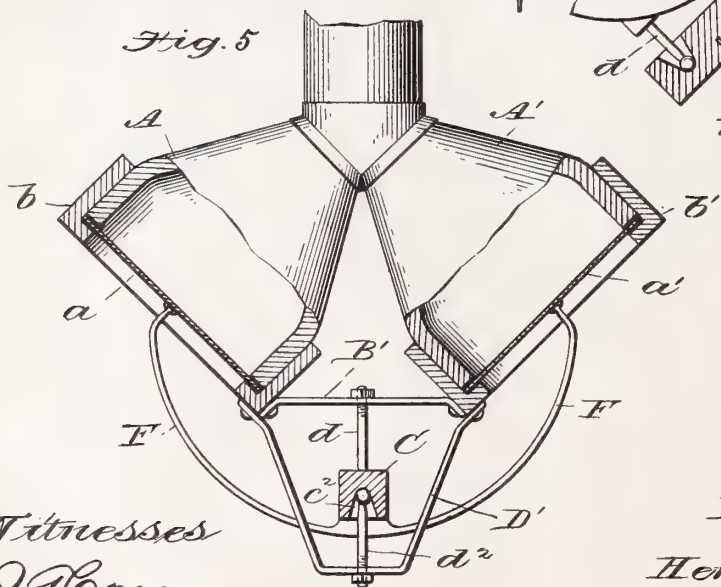
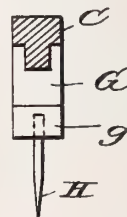


Fig. 4.



Witnesses

J. A. Cross
J. Henderson.

Inventor

Henry Jones
by I. H. Peters,
Attorney.

UNITED STATES PATENT OFFICE.

HENRY JONES, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 628,810, dated July 11, 1899.

Application filed June 11, 1898. Serial No. 683,182. (No model.)

To all whom it may concern:

Be it known that I, HENRY JONES, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention relates to certain improvements in sound recording and reproducing machines, and has for its object to provide an improved construction by means of which the sound delivered from the trumpet or other receiver is greatly improved both in tone and in volume, the harsh and grating effect which has heretofore been experienced in all machines of this class being completely eliminated and a clear and distinct articulation obtained and the sound softened and otherwise improved.

With this object in view my invention consists in providing twin sound-boxes rigidly secured together in diaphragms which are connected by a single arm pivotally secured in the said rigid frame and connected to and operated by a single stylus.

My invention further consists in providing the stylus-supporting bar with ball-bearing studs both on its top and bottom, said construction permitting the easy lateral movement of said supporting-bar, at the same time preventing longitudinal or endwise movement.

A further object of my invention is to provide with the twin sound-boxes an arm pivotally mounted between the two diaphragms of said sound-boxes, said mounting being substantially on a line with the lines of the diaphragm and adapted to oscillate upon the pivot of such mounting, the said arm extending in opposite directions on each side of its pivotal point, its outer ends being connected in the center of one of the diaphragms.

A still further object of my invention is to provide the stylus-holders with a thin resilient end to be secured to the supporting-bar, which is pivotally mounted in the supporting-frame, said plate being broadened for rigidity in a crosswise direction.

My invention further consists in the con-

struction, combination, and arrangement of parts, such as will be hereinafter fully described, and particularly pointed out in the claims.

Referring to the accompanying drawings, which form a part of this specification and in which similar letters of reference are used to indicate similar parts, Figure 1 is a sectional elevation of a portion of a gramophone having my improvements applied thereto. Fig. 2 is a transverse section taken about on the line 2 2 of Fig. 1, parts of the supporting-frame being broken away and the sound-boxes omitted. Fig. 3 is a detail, partly in section, showing the application of my pivoted stylus-supporting bar to a single sound-box. Fig. 4 is a detail plan view of the stylus-securing plate attached to the bar C, which is shown in section. Fig. 5 is a side elevation, partly in section, showing the sound-boxes inclined and terminating in a single trumpet.

In carrying out my invention I provide two sound-boxes A A' of the usual construction, each provided with a diaphragm *a* and *a'*, secured to and adjusted upon the said sound-boxes by means of the caps *b b'*. On the upper outside surface of the sound-boxes A A' is rigidly secured a supporting-plate B, which holds the two sound-boxes rigidly together and forms a part of the supporting-frame. Located centrally between the two sound-boxes A A' and on a line with the horizontal plane of the diaphragms is a supporting-bar C, having in its upper surface sockets *c c'* for the reception of the lower ends of the ball-bearing studs *d d'*, the upper ends of said studs being rigidly secured in the frame-plate B by means of suitable screw-threads and nuts, as illustrated, or in any other well-known manner. On the under side of the said supporting-bar C is a socket *c²*, located to one side of its longitudinal center and adapted to receive the upper end of the ball-bearing stud *d²*. The lower end of this stud *d²* is secured by means of screw-threads and nuts or otherwise in a transversely-arranged bar D, secured at its ends to the sound-boxes A A' by means of the standards *e e'*.

Rigidly secured to the under side of the supporting-bar C is a transversely-arranged arm F, extending on each side of the said supporting-bar C and having its respective

ends connected to the center of the diaphragms $a a'$, as clearly illustrated in Fig. 1 of the drawings. To the under side of the supporting-bar C and slightly to one side of the transverse arm F is secured the stylus-holder G, which may be soldered to the said bar C or secured thereto in any other well-known manner. This stylus-holder G consists of a thin resilient flat metal bar, increasing in thickness as it reaches the lower end and terminating in an enlarged socket or sleeve g for the reception of the stylus-point H. A suitable set-screw h is provided in said sleeve g for securely holding the stylus-point in the stylus-holder.

The sound-boxes A A' are preferably connected, as in the construction shown in Fig. 1, each to an independent horn. The construction shown in Fig. 5 is especially adapted to connection with a single horn.

From the foregoing description it will be readily seen that the supporting-bar C, which carries the arms F, which are connected to the diaphragms $a a'$ at their respective centers, is capable of oscillating on its ball-bearing studs under the action of the vibrations produced through the stylus by the sound-waves of the record-disk. This oscillatory movement of the said supporting-bar C and its connecting-arms F causes a pulling movement on one of the diaphragms and a simultaneous pushing on the other, thus doing away with the necessity of any springs to return the said diaphragms to a normal position, as has heretofore been the practice.

In Fig. 3 I have illustrated a single sound-box, showing the supporting-bar C provided with the ball-bearing studs $d d'$ on its upper surface, the rigid ends of which are secured directly to the frame or cap b of the sound-box, while the stud d^2 on the lower side is secured in a bracket d^3 , also rigidly connected to the supporting-frame of the sound-box. A single arm F' is rigidly secured at one end to the supporting-bar C and at its other end to the center of the diaphragm a . The stylus-support G is constructed and secured to the supporting-bar C in substantially the same manner as heretofore described.

In Fig. 5 I have illustrated my sound-boxes in inclined positions, so as to economize in space and having the ends of the said sound-boxes terminating in a single tube to be connected to the trumpet or other receiving device. In this construction the supporting-bar C is located centrally between the two sound-boxes A A' and is provided with the ball-studs on its top and bottom, the pivotal bearing-points of which are on a line at the intersection of the longitudinal plane of said diaphragms, as clearly illustrated. A supporting-frame B' is secured at each end to the caps $b b'$ of the sound-boxes for supporting the upper ends of the studs $d d'$. A depending U-shaped rod D', secured at each end of the caps B B' of the sound-box, is provided for the support of the lower end of the stud

d^2 . The arm F, rigidly secured to the supporting-bar C, extends on each side, and its respective ends are loosely connected to the center of the diaphragms $a a'$, and the operation of this construction is substantially the same as that described with reference to Figs. 1 and 2.

I have referred to the studs $d d'$ as "ball-bearing" studs. It is clear, however, that it is not essential that the point of these studs should be shaped in a ball form, as they are antifrictional bearings and might therefore be pointed or tapered and answer the requirements.

By my above-described construction of pivoted or ball-bearing stylus-supporting bar located centrally on a line with the diaphragms I do away with friction and provide an easy bearing, which permits of easy oscillation of the said bar and also prevents the transmission of an unnatural grating sound, which would be caused by undue friction at such point. By providing the twin sound-boxes and a single arm connected at its free ends to the diaphragm and rigidly connected to the stylus-supporting bar I am enabled to do away with springs for returning the said diaphragms to normal positions, as by the oscillatory movement imparted to the said arms through the medium of this pivot-supporting bar and connecting-stylus heretofore described I obtain a pushing and pulling movement alternately on the diaphragms.

In the construction of stylus-support shown in Fig. 4 the plate G is made of reduced thickness, tensioned to slightly yield under the weight of the sound-box—as, for instance, in use in machines known as the "gramophone"—and broadened, so as to be unyielding in the direction of the sound-waves. In the construction shown the plate G is mortised or set into the bar C in slots provided for the purpose and rigidly secured therein.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, multiple diaphragms and sound-boxes having their diaphragms connected through the medium of rigid arms with a single stylus-bar and adapted to pulsate at the same time in opposite directions, substantially as described.

2. In a sound recording and reproducing machine, twin sound-boxes set in a rigid frame, a pivoted stylus-bar, a rigid arm connecting said stylus-bar with each diaphragm, said diaphragms adapted to vibrate at the same time in opposite directions, substantially as described.

3. In a sound-reproducing machine, a stylus loosely mounted between two diaphragms, adapted to oscillate from the pivot of such mounting, arms rigidly connected to said stylus, the outer ends of which are connected to the center of the diaphragms, substantially as described.

4. In a sound-reproducing machine, the combination of twin sound-boxes, diaphragms carried thereby, a stylus loosely mounted between the same, and on a line with the plane of the diaphragms, said stylus adapted to oscillate from the pivot of its mounting, arms rigidly connected to said stylus the outer ends of which are connected to the center of the diaphragms, substantially as described.

5. In sound-reproducing machines, the combination of twin sound-boxes, a supporting-frame rigidly connecting them together, diaphragms carried by said sound-boxes, a stylus-supporting bar carried by said supporting-frame, pivotal bearings for said stylus-bar located on a line with the plane of the diaphragm, an arm rigidly connected to said stylus-bar its free ends extending in opposite directions and connecting at each end with one of the diaphragms, substantially as described.

6. The combination of the twin sound-boxes, diaphragms carried thereby, a supporting-frame rigidly connecting the sound-boxes, a stylus-supporting bar located between the sound-boxes, studs carried by the supporting-frame adapted to bear in sockets formed on the upper and lower sides of the stylus-sup-

porting bar, an arm rigidly connected to the said stylus-supporting bar having its free ends extending in opposite directions and connected to one of the diaphragms, and a stylus secured in said supporting-bar, substantially as described.

7. The combination of the twin sound-boxes provided with diaphragms, a frame rigidly connecting them together, a stylus-supporting bar located centrally between the said sound-boxes, sockets formed at each end on the upper side of said supporting-bar, studs rigidly secured in the supporting-frame having balls on their lower ends adapted to the said sockets, a socket formed on the lower side of said stylus-supporting bar, a stud carried by the supporting-frame having a ball on its upper end adapted to said socket, the said ball-bearings being on a line with the diametrical center of the diaphragms, and a stylus carried by the stylus-supporting bar, substantially as described.

In witness whereof I have hereunto set my hand this 8th day of June, A. D. 1898.

HENRY JONES.

Witnesses:

J. HENDERSON,
HORACE PETTIT.

No. 628,811.

Patented July 11, 1899.

H. JONES.
SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed June 11, 1898.)

(No Model.)

Fig. 1.

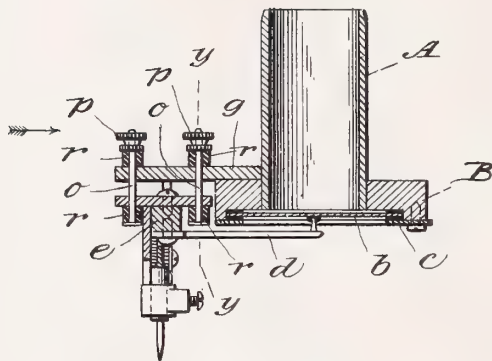


Fig. 2. x

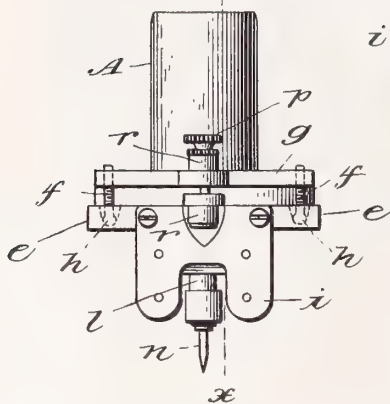


Fig. 6.

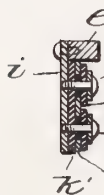


Fig. 3.

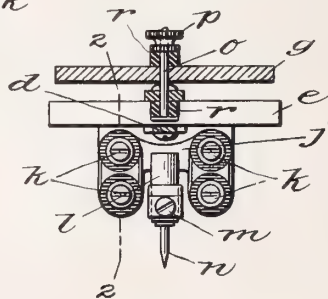


Fig. 4.

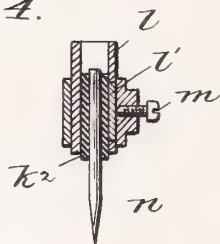
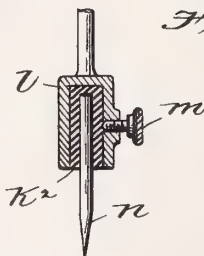


Fig. 5.



Witnesses.

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Henry Jones,

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UNITED STATES PATENT OFFICE.

HENRY JONES, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 628,811, dated July 11, 1899.

Application filed June 11, 1898. Serial No. 683,183. (No model.)

To all whom it may concern:

Be it known that I, HENRY JONES, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have
5 invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming
10 part of this specification.

My invention has relation to sound recording and reproducing machines, and has for its principal object to provide a construction in what is known as the "sound-box" and its
15 immediate attachments which will reduce to a minimum the "scratching" effect which is very noticeable and objectionable in most of the sound-boxes in use.

A further object of my invention is to provide an improved construction of mounting the stylus-bar upon the sound-box casing, whereby better results are produced than in constructions heretofore invented.

As is well known, in some talking-machines,
25 as the phonograph and graphophone, the undulations of the sound-waves are recorded in the base of the grooves of the record. In others, as in the gramophone, the undulations of the sound-waves are reproduced in the sides
30 of the grooves of the record. In the former cases the objectionable scratching effect is produced by microscopic unevenness of the sides against which the side or sides of the stylus come in contact. In the latter case
35 the scratching effect is produced by the extreme point coming in contact with like unevennesses in the bases of the running grooves. These produce foreign and false notes or sounds which intermingle with the true notes
40 and tones of the record undulations. The true undulations in either construction of record are transmitted to the diaphragm by a positive true vibration of the stylus point and bar in given directions. The false accidental
45 unevennesses of the sides or bases of the grooves, as the case may be, tend to vibrate the point and stylus-bar to which it is connected in the ordinary construction in producing a tremor in a direction substantially
50 at right angles to the true vibrations, which if communicated from the stylus-point to the stylus-bar will then be communicated into or along the sound-box to the trumpet or re-

ceiver and produces the scratching effect, mingling with the true notes of the record. 55
The object of my invention is to nullify or minimize this false vibratory effect primarily by preventing as far as possible its communication from the stylus-point to the stylus-bar at the point of attachment and, further, 60
to nullify or minimize between this securing-point and the connection of the stylus-bar with the frame of the sound-box any of the false vibratory effects which may have been transmitted to the stylus-bar. 65

In the accompanying drawings, Figure 1 is a sectional view of a sound-box of a sound recording and reproducing machine embodying my invention, drawn on the line *x x* of Fig. 2. Fig. 2 is an end view of the same 70 looking in the direction of the arrow in Fig. 1. Fig. 3 is a cross-sectional view of the same on the line *y y* of Fig. 1. Fig. 4 is an enlarged detail view of one form of the stylus-point-securing device for securely holding the stylus-point and at the same time preventing to 75 a considerable degree the false vibrations occasioned in the point of the stylus and which prevents the scratching effect from being transmitted to the stylus bar and casing. Fig. 80
5 is a modification of the stylus-point-securing device for the same purpose. Fig. 6 is a sectional view on the line 2 2 of Fig. 3.

A represents the receiver or transmitter, as the case may be, secured to the disk-shaped 85 diaphragm-holder B, which is recessed in the ordinary manner for the reception of the diaphragm *b*, the diaphragm being held in place by the rings or gaskets *c*, of rubber or other suitable material, at its periphery on either 90 side. The stylus-bar *d* is in the construction shown secured to a transverse bar *e*, hinged or pivoted upon pins *f*, which are secured at their inner ends to a plate *g*, rigidly secured to the disk portion B. The pins *f* have on their 95 outer ends balls or knobs *h*, (shown in dotted lines in Fig. 2,) which are adapted to concave recesses in the inner face of the bar *e*, forming substantially ball-and-socket joints. To this bar *e* is secured by screws or otherwise, as shown in Fig. 2, a downwardly-projecting plate *i*, to which plate *i* is then secured the plate *j*, as through the medium of the screws *k*. This plate *j* is rigidly provided with 100 a sleeve *l* and thumb-screw *m*, in which the stylus-point *n* is adjustably attached. Be-

tween the plates *i* and *j* I provide a layer of sound-non-transmitting material *k'*—such, for instance, as rubber or other suitable material—and I also preferably provide a layer of the same material between the heads of the screws *k* and the plate *j*, also around the screws *k* where they pass through the plate *j*, the holes in the plate being enlarged for the purpose, as illustrated in Fig. 6. To hold the bar *e* and the parts which it carries in position upon the headed pins *f* and to prevent displacement, I provide in the bar *e*, midway in its length, the transverse bolts *oo*, secured at one end directly or indirectly in the bar *e* and having on the opposite end adjusting-screws *p p*. Between the inner head of these bolts and the bar to which they are attached and also between the adjusting-screws *p* and the plate *g* I provide rubber blocks or spiral springs *r*. By this construction the tension on the ball-and-socket joint of the combined plate and bars, forming practically the stylus-bar, is easily regulated and the relative position of the stylus-bar *d* to the diaphragm may be accurately adjusted.

In the construction shown in Fig. 4 the tubular section of sound-non-transmitting material is compressed around the needle or stylus-point *n* through the set-screw *m* in forcing the broken section *l'* of the tubular portion *l*, thus holding it firmly in position. The stylus-point, however, may be firmly held in position by other constructions—such, for instance, as that illustrated in Fig. 5. The material *k²* must be sufficiently rigid to firmly hold the point in the holder *l*, so that the true vibratory motion of the sound-waves shall not be lost at the point of connection, though the irregular undefined “scratching” will be deadened at the point of connection. It is clear that the intervening layers of sound non-transmitting or deadening material *k'* operates in a similar manner to still further deaden any scratching effect which may have been transmitted to the plate *j*, as hereinbefore described.

It is apparent that the construction herein described may be modified without departing from the spirit of my invention.

The structure which I have described is a preferable form of construction and well illustrates the invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, a stylus-bar mounted upon the sound-box frame in pivotal bearings having on either side of the line of the said pivotal bearings an adjustable tension device for regulating the tension of the bearing and the yielding of the stylus-bar in the operation of the device, substantially as described.

2. In a sound recording and reproducing machine, an L-shaped stylus-bar mounted upon the frame of the sound-box in pivotal bearings comprising the pins, *f*, adapted to re-

cesses in the plate, *e*, adjusting-rods, *o*, provided on either side of the pivotal bearing connected to the L-shaped stylus-bar and to the sound-box frame, intervening tension media, *r*, provided on said rods, and adjusting-nuts, *p*, substantially as described.

3. In a sound recording and reproducing machine, a sectional stylus-bar, having the depending sections, *i, j*, a layer of sound-deadening material, *k'*, interposed between said sections, a securing-section, *l*, and a layer of sound-deadening material, *k²*, provided in said securing-section around the stylus-point, substantially as described.

4. In a sound recording and reproducing machine, an L-shaped stylus-bar composed of the bar, *d*, transverse bar, *e*, plates, *i, j*, disposed at right angles to bar, *d*, stylus-point receiver, *l*, and tubular section of sound-deadening material, *k²*, provided in said section, *l*, around the stylus-point, *n*, the whole being yieldingly mounted upon the sound-box, substantially as described.

5. In a sound recording and reproducing machine, an L-shaped stylus-bar composed of the bar, *d*, transverse bar, *e*, plate, *i, j*, disposed at right angles to bar, *d*, stylus-point receiver, *l*, a tubular section of sound-deadening material, *k²*, provided in said section, *l*, around the stylus-point, *n*, the said sections forming the said L-shaped stylus-bar having a pivotal connection to the frame of the sound-box comprising the headed bolts, *f*, provided in the plate, *g*, adapted to concave recesses in the bar, *e*, and the rods, *o*, arranged centrally of the bar, *e*, and in a radial line with the diaphragm center, one end of each of said rods being adjustably connected to the bar, *e*, and the opposite end to the plate, *g*, rigidly secured in the sound-box, and adjusting-screws, *p*, and tension devices, *r*, provided on the outer ends of said rods, *o*, to regulate the tension of the joint, substantially as described.

6. In a sound recording and reproducing machine, a tubular section, *A*, a disk section, *B*, diaphragm, *b*, L-shaped stylus-bar comprising the bar, *d*, transverse bar, *e*, plates, *i, j*, intervening layers of sound-deadening material, *k'*, transverse securing-screws, *k*, tubular section, *l*, with adjustable section, *l'*, provided therein, securing-screw, *m*, intervening layer of sound-deadening material, *k²*, around the stylus-point in the section, *l*, headed bolts, *f*, secured to the plate, *g*, adapted to concave recesses in the bar, *e*, rods, *o*, connecting the bar, *e*, with the plate, *g*, encircling yielding media, *r*, provided upon the rods, *o*, and adjusting-nuts, *p*, provided upon the said rods, substantially as described.

In witness whereof I have hereunto set my hand this 8th day of June, A. D. 1898.

HENRY JONES.

Witnesses:

J. HENDERSON,
HORACE PETTIT.

No. 628,812.

Patented July 11, 1899.

H. JONES.

SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Aug. 13, 1898.)

No Model.)

Fig. 1.

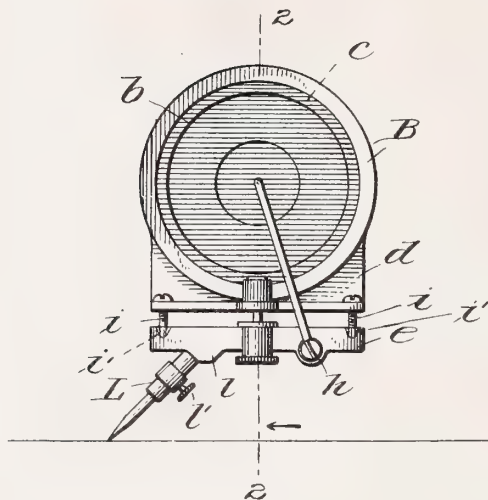


Fig. 2.

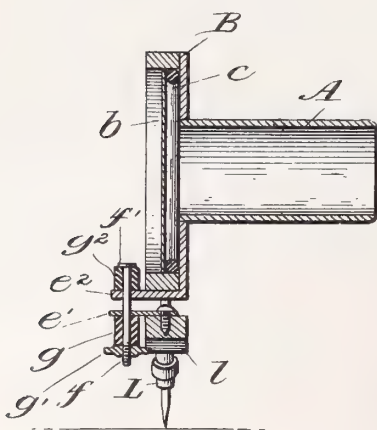
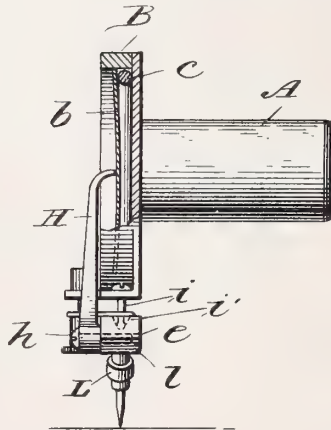


Fig. 3.



Witnesses.
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Harry Miller

Inventor.
Henry Jones,
by I. H. Peters,
Attorney.

UNITED STATES PATENT OFFICE.

HENRY JONES, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 628,812, dated July 11, 1899.

Application filed August 13, 1898. Serial No. 688,513. (No model.)

To all whom it may concern:

Be it known that I, HENRY JONES, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention has relation to certain improvements in sound recording and reproducing machines; and the principal objects of the said invention are to provide an improved construction of sound-box; also, to provide an improved construction of mounting the stylus-bar upon the sound-box casing, whereby greatly-improved results are obtained.

My invention consists in the construction, combination, and arrangements of parts, such as will be hereinafter more fully described, and particularly pointed out in the claims.

Referring to the accompanying drawings, forming part of this specification and in which similar letters of reference are used to indicate similar parts, Figure 1 is a front elevation of a sound-box embodying my improvements. Fig. 2 is a central vertical section taken about on the line 2 2 of Fig. 1, looking in the direction of the arrow. Fig. 3 is a side elevation of the same, a portion of the sound-box casing being broken away and the diaphragm being shown in section.

In the said drawings, A designates the receiver or transmitter, as the case may be, which is secured to the circular diaphragm-holder B, in which is loosely fitted the diaphragm *b*, having on its rear side a rubber washer or ring *c*, which keeps the said diaphragm away from the casing B. Extending from the lower side of the casing B and formed integral therewith is a flanged plate *d*, and a short distance below this flange *d* is the transversely-arranged stylus-supporting bar *e*, which runs parallel with the part *d* and is secured thereto by means which will be hereinafter described. In this construction the stylus-bar is connected directly with the transversely-arranged supporting-bar *e*, which also has rigidly connected to it the stylus-holder, thereby making a rigid con-

nection between the stylus-point and the diaphragm.

In about the center of the supporting-bar *e* is a projecting lug *e'*, provided with an aperture for the reception and support of a transversely-arranged bolt *f*, and on the flange of the plate *d* is formed a similar-shaped projection *e''*, also provided with an aperture for the reception and support of the bolt *f*. On the bolt *f*, below the support *e'*, I provide a resilient block *g*, of rubber or other suitable material, the said block abutting against the projection *e'* and against a milled disk *g'*, which is screw-threaded on the lower end of the bolt *f*. On the upper end of the said bolt *f* and bearing against the upper side of the projection *e''* is a similar rubber block *g''*, having its upper end abutting against the small washer *f'*, which is rigidly secured to the bolt *f*. These rubber blocks *g g''* form springs, the tension of which can be adjusted by means of the milled head or nut *g'*, and serve to exert pressure on the stylus-bar and keep it in contact with the diaphragm *b*, the elasticity of the diaphragm acting as a spring in the other direction and returning said diaphragm to its normal position. Instead of using the resilient blocks *g g''* coiled springs might be used with the same result.

The stylus-bar II is secured to the supporting-bar *e* by means of a suitable screw, such as *h*, thereby making it rigid with the said supporting-bar, and the upper end of the said stylus-bar bears against the diaphragm at its center, as illustrated, the springs *g g''* tending to keep it in contact with the diaphragm, as heretofore described.

In each end of the flange on the plate *d* are openings screw-threaded for the reception of the pivot-screws *i*. The upper surface of the stylus-supporting bar *e* is provided with socket-openings *i'*, adapted for the reception of the balls formed on the end of the pivot-screws *i*, thereby forming practically a ball-and-socket joint at each end of the stylus-supporting bar, so that the said supporting-bar can have easy lateral movement when vibrated under the action of the sound-waves transmitted through the stylus, the said pivot-screws also serving to prevent any longitudinal movement of the stylus-support, which

would be objectionable. The bolt *f* and its springs, heretofore described, serve to hold the stylus-supporting bar to the plate *d* of the diaphragm-holder B.

- 5 On the under side of the stylus-supporting bar *e* and to one side of the center thereof is a projecting lug *l*, to which is rigidly secured the stylus-holder L, provided with the set-screw *l'* for holding and adjusting the stylus.
- 10 The stylus-point and its holder are illustrated as being at an angle of about forty-five degrees, which of course might be changed, although it is generally considered as essential that the stylus-point be set at an angle in
- 15 machines of this character.

The operation of my invention will be readily understood from the foregoing description.

- The exact construction herein described
- 20 and illustrated might be modified without departing from the spirit of my invention; but the structure shown is a preferable form of construction and thoroughly illustrates the invention.

- 25 Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, the combination with the diaphragm-holder of a supporting-bar pivotally
- 30 connected thereto, a stylus-bar rigidly secured to the said supporting-bar adapted to bear against the diaphragm-plate, a stylus-point rigidly connected to the said supporting-bar and means applied to the said supporting-bar for exerting pressure against the
- 35 diaphragm in one direction, substantially as described.

2. In a sound recording and reproducing
- 40 machine, the combination of a diaphragm-holder a supporting-bar carried by the diaphragm-holder, pivotal connection between the said holder and the supporting-bar, a stylus-bar rigidly secured to the supporting-
- 45 bar and adapted at its upper end to bear against the diaphragm, a stylus-point carried on the lower side of said supporting-bar, and a spring connection between the said supporting-bar and the diaphragm-holder for exert-
- 50 ing pressure on one side of the diaphragm, substantially as described.

3. In a sound recording and reproducing machine, the combination of a diaphragm-holder, a diaphragm loosely mounted therein,
- 55 a yielding ring interposed between the said diaphragm and its holder, a supporting-bar carried by the diaphragm-holder, pivotal joints between the said supporting-bar and

the diaphragm-holder, a stylus-bar rigid with the said supporting-bar adapted to bear at its upper end on the diaphragm, a stylus-point rigidly connected to the said bar, and a spring connection between the supporting-bar and the diaphragm-holder on one side thereof adapted to exert pressure through the medium

6 of the stylus-bar on one side of the diaphragm, substantially as described.

4. In a sound recording and reproducing machine, the combination of a diaphragm-holder, a diaphragm loosely mounted therein,
- 7 a supporting-bar carried by the said holder pivotally connected thereto, a stylus-bar and stylus rigid with the said supporting-bar, spring connections between the supporting-
- 7 bar and the diaphragm-holder on one side thereof and means for adjusting the tension of the said springs for regulating the pressure exerted upon the diaphragm, substantially as described.

5. In a sound recording and reproducing
- 8 machine, the combination with the diaphragm and its holding-frame, a transversely-arranged supporting-bar, sockets provided in the ends of said bar, studs carried by the diaphragm-holding frame adapted to the said
- 8 sockets, a bolt passing through the supporting-bar and through the diaphragm-holding frame, springs arranged on said bolt to press the stylus-bar against the diaphragm in one
- 9 direction only, a screw for adjusting the tension of said springs, a stylus-bar rigidly connected to the supporting-bar adapted to be held in contact with the diaphragm through the action of the said springs and a stylus-
- 9 point rigidly secured on the under side of the supporting-bar, substantially as described.

6. In a sound recording and reproducing machine, the combination of the diaphragm loosely mounted in a holding-frame, a flanged plate, *d*, formed on the holding-frame, a lug,
- 1 *e*², formed on the said flange, a stylus-supporting bar having a stylus-bar, H, rigidly secured thereto, a stylus-point carried on the lower side of said supporting-bar, ball-bearing studs, *i*, adapted to the sockets, *i'*, an extension, *e'*, secured to the upper side of said
- 1 bar, a bolt, *f*, supported by the extensions, *e'*, *e*², a screw-threaded nut on one end of said bolt, and springs, *g*, *g*², arranged, substantially as described.

In witness whereof I have hereunto set my hand this 11th day of August, A. D. 1898.

HENRY JONES.

Witnesses:

BENJ. F. PERKINS,
HORACE PETTIT.

H. JONES.

SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Dec. 17, 1898.)

(No Model.)

Fig. 1.

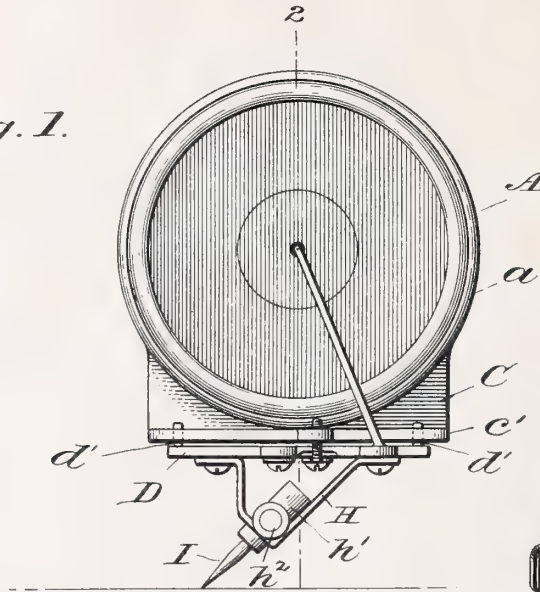


Fig. 6.



Fig. 2.

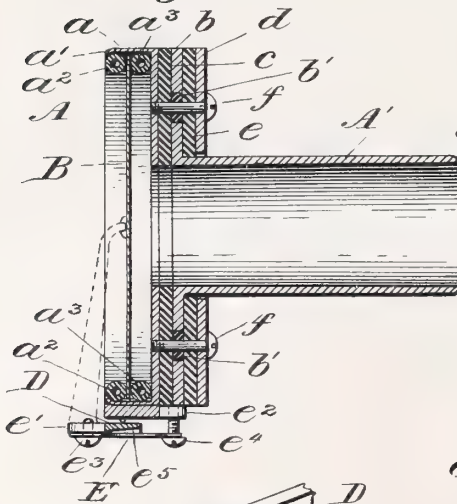


Fig. 3.

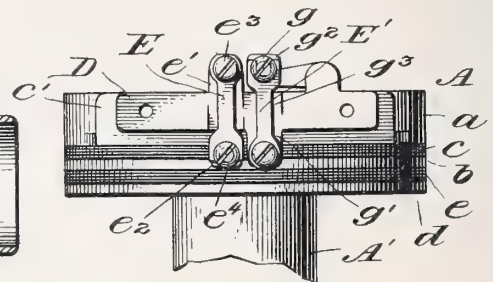


Fig. 4.

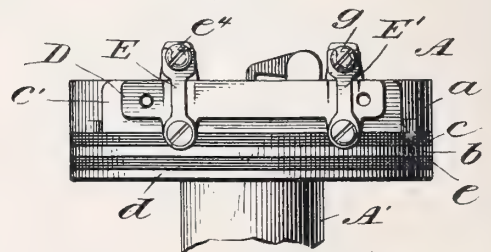


Fig. 5.

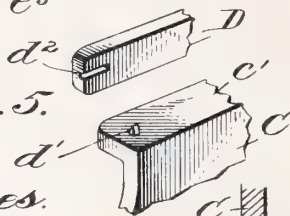
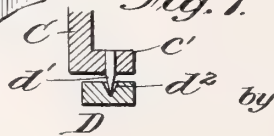


Fig. 7.



Witnesses.
J. Cross.
Harry Miller

Inventor,
Henry Jones,
1 Stone Pettit,
Attorney.

UNITED STATES PATENT OFFICE.

HENRY JONES, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 628,813, dated July 11, 1899.

Application filed December 17, 1898. Serial No. 699,555. (No model.)

To all whom it may concern:

Be it known that I, HENRY JONES, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to certain improvements in gramophones and other sound recording and reproducing machines of a like nature; and the principal object of my said invention is to improve the construction of the recording and reproducing mechanism, especially that part known as the "sound-box and stylus-supporting bar," by means of which the sound delivered from the receiver is greatly improved and a clear and distinct articulation obtained.

With this object in view my invention consists in providing a simple and efficient means for securing the diaphragm in the sound-box, whereby it can be easily and quickly removed and replaced without unscrewing any of the parts.

My invention further consists in providing a sound-box constructed in sections and having the different sections insulated from each other, so as to prevent any harsh or metallic sounds that might emanate from the stylus-bar and stylus-point from being communicated to the receiver.

My invention still further consists in an improved construction of stylus-bar and the manner in which it is secured to the sound-box frame, and also in providing an improved spring or springs connected to the said stylus-bar and to the sound-box frame for returning the said stylus-bar and diaphragm to normal position after it has been acted upon under the impulses of the sound-waves produced through the stylus-point.

My invention further consists in the construction, combination, and arrangement of the different parts, such as will be hereinafter fully described, and particularly pointed out in the claims made hereto.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference are used to indicate

similar parts, Figure 1 is a front elevation of a sound-box and stylus-bar embodying my invention. Fig. 2 is a central sectional view taken on the line 2 2 of Fig. 1, having a sleeve for holding the stylus-point omitted. Fig. 3 is a side elevation of the sound-box having the bracket for supporting the stylus-point removed and illustrating the springs for turning the stylus-bar and diaphragm to normal position. Fig. 4 is a view similar to Fig. 3, illustrating a modified arrangement of springs. Fig. 5 is a detail perspective illustrating the knife-edge bearings between the stylus-bar and the sound-box frame. Fig. 6 is a detail perspective view of one of the springs for the stylus-bar. Fig. 7 is an enlarged detail section through the knife-edge bearings.

In carrying out my invention I provide a sound-box A of the ordinary shape and size, provided with the usual tubular sleeve A' for connection with the trumpet or other receiver. The front part of the said sound-box A is formed of an independent box or ring a, open in front and having its outer rim or flange curved or bent over, as illustrated at a' in Fig. 2 of the drawings. A circular tube or gasket a³ is fitted against the back of the box a, against which rests the diaphragm B, and a second rubber tube or gasket a² is fitted on the other side of the said diaphragm B and held in place by means of the bent or rounded edges a' of the box-rim. These rings being of flexible material, it will be readily understood that by contracting them they can be easily removed from the sound-box frame and the diaphragm B released. The section b of the sound-box consists of a metallic disk having formed integral therewith the tubular sleeve A'. Between this and the section a is interposed a ring c, of rubber or other sound-non-conducting material. A metallic ring d, having an opening in its center through which the tubular section A' passes, is provided, and interposed between this section d and the section b is a ring e of sound-non-conducting material. The sections a, b, c, d, and e are securely fastened together by means of the screw f, and around the apertures provided in the section b is secured a rubber sleeve b', as illustrated in Fig. 2 of the drawings. It will thus be seen from the above-described construction that the dia-

phragm B is entirely insulated from the sound-box and that the tubular section A' is also insulated from the section *a* of the sound-box, which tends to minimize or prevent grating
5 or metallic sounds from being transmitted from the stylus-bar to the receiver.

On the lower edge of the sound-box is a projection C, having a projecting flange *c'* for supporting the stylus-bar D. On the lower
10 surface of the flange *c'* are formed knife-edges *d'*, located at each end of the said flange and adapted to fit in V-shaped grooves *d*², formed in the upper surface of the stylus-bar D. These knife-edges *d'* may either be riveted
15 in the section *c'* or cast therewith or screwed in, as illustrated in dotted lines in Fig. 1 of the drawings. On the edge of the stylus-bar D is a lug *e'*, and on the rear edge of the flange *c'* is a lug *e*², located directly opposite
20 the lug *e'*. To the lug *e'* is secured one end of a flat spring E by means of the screw *e*³, while the other end of the said spring E is secured to the lug *e*² by means of the screw *e*⁴. This end of the spring E is formed with
25 a forked or slotted portion *f'*, through which the screw *e*⁴ passes. A recess or cut-away portion *e*⁵ is formed in the stylus-bar D above the spring E, as illustrated in Fig. 2 of the drawings. It will be seen that one end of the
30 spring E is rigidly secured to the stylus-bar at *e*³, while the other end is loosely secured in its slot *f'* to the screw *e*⁴, which is carried by the lug *e*² of the sound-box frame. A second spring E' is provided, located by the
35 side of the spring E, but secured in an opposite manner, as illustrated most clearly in Fig. 3 of the drawings. The rigid end of this spring E' is secured to a lug *g'*, formed on the back edge of the stylus-bar D, while the slot-
40 ted end *f'* is engaged by a screw *g*, carried by a lug *g*², formed on the front edge of the flange *c'* of the sound-box frame. A cut-away portion *g*³ is also provided below this spring E'. Thus as the stylus-bar D is vibrated by means of the sound-waves trans-
45 mitted from the record through the stylus-point the springs E E' act on the said bar D to return it to normal position, the spring E acting in the one direction, while the spring
50 E' acts in the other direction. The knife-edges *d'* act as pivots upon which the said stylus-bar D swings.

The lower side of the stylus-bar D is secured to bracket H, having formed thereon a sleeve
55 *h'*, adapted to receive the stylus-point I. The set-screw *h*² is provided in the said sleeve *h'* for securely holding the stylus I in position.

In Fig. 4 of the drawings I have illustrated the springs E E' as being located on the stylus-bar D near the ends thereof, so as to
60 more evenly distribute their pressure upon the said stylus-bar and at points nearer the pivotal knife-bearings *d'* *d*². When I employ this arrangement, I have both the springs
65 E and E' secured at one end to the stylus-bar D and having their other ends loosely held by the screws *e*⁴, carried by the sound-

box frame and exerting their pressure in one direction only.

While I have described and shown the use 70 of the double springs E E' and prefer this form, a single spring might be used with good results.

Various slight changes and modifications might be made in the construction of my device without departing from the spirit and scope of my invention. Hence I do not desire to limit myself to the exact construction shown and described.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing machine, a sound-box open at its front end, a diaphragm adapted to said sound-box, and
8 a flexible spring-ring adapted to fit snugly in the sound-box for retaining the diaphragm in position, substantially as described.

2. In a sound recording and reproducing machine, a sound-box having a diaphragm located therein, flexible rings located on each side of said diaphragm, and an overlapping rim formed on the sound-box adapted to partly embrace the outer ring and hold the same in position.

3. In a sound recording and reproducing machine, a sound-box comprising a section, *a*, a diaphragm located therein insulated from the sound-box, a stylus-bar carried by the section, *a*, a section, *b*, having a tubular extension for attachment of the trumpet, a layer of sound-non-conducting material, *c*, located between the sections, *a* and *b*, a ring-section, *d*, and a layer of sound-non-conducting material, *e*, located between the sections, *b*, and *d*, substantially as described.

4. In a sound recording and reproducing machine, a sound-box comprising a section, *a*, a diaphragm located therein and insulated therefrom, a stylus-bar carried by said section, *a*, a section, *b*, having a tubular extension, A', apertures formed in said section for the reception of bolts, sleeves of insulating material provided in said apertures, a section, *c*, of sound-non-conducting material located between sections, *a*, and *b*, a ring, *d*, a layer of sound-non-conducting material between the sections, *b* and *d*, and bolts, *f'*, for connecting the said sections together, substantially as described.

5. In a sound recording and reproducing machine, the combination with the sound-box and diaphragm, of an extension formed on the lower edge of said sound-box, knife-edges formed in said extension, a stylus-bar having grooves adapted to receive the knife-edges, and springs connected at one end to the stylus-bar and at the other end to the sound-box extension, substantially as described.

6. In a sound recording and reproducing machine, the combination of a sound-box and diaphragm, a stylus-bar pivotally connected to an extension on the sound-box, knife-edge

5 bearings for said stylus-bar, and a pair of flat springs, E, E', one of said springs being rigidly connected at one end to the stylus-bar and loosely connected at its end to the sound-box while the other spring is rigidly connected at one end to the opposite side of the stylus-bar and loosely connected at its other end to the opposite side of the sound-box, substantially as described.

10 7. In a sound recording and reproducing machine, the combination of a sound-box, a diaphragm carried thereby, a stylus-bar, knife-edge bearings between the stylus-bar and sound-box, a pair of flat springs, E, E',

each rigidly connected to the stylus-bar, but 15 on opposite sides, having their other ends loosely connected to the sound-box frame on opposite sides, recesses, e^5 and g^3 , provided in the stylus-bar under the respective springs, and a bracket, H, secured to the stylus-bar 20 for supporting the stylus-point, substantially as described.

In witness whereof I have hereunto set my hand this 14th day of November, A. D. 1898.

HENRY JONES.

Witnesses:

BENJ. F. PERKINS,

HORACE PETTIT.



No. 629,534.

Patented July 25, 1899.

R. WOLF.
GRAPHOPHONE MANDREL.

(Application filed Oct. 31, 1898.)

(No Model.)

Fig. 1.



Fig. 2.

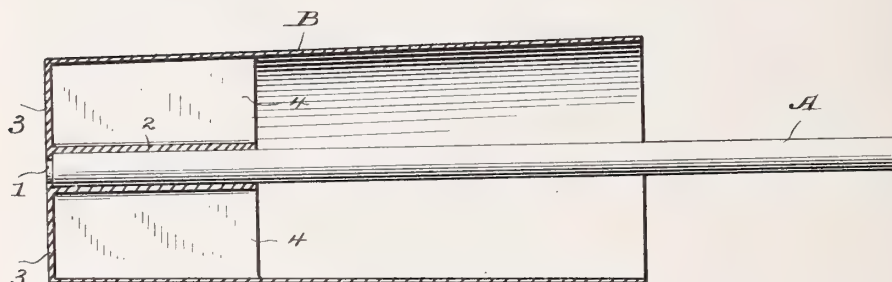
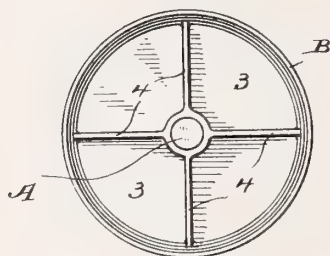


Fig. 3.



WITNESSES

H. A. Lamb
S. V. Heley.

INVENTOR

Rudolf Wolf
By J. M. Wooster
att.

UNITED STATES PATENT OFFICE.

RUDOLF WOLF, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR OF ONE-HALF
TO CHARLES KUTSCHER, OF SAME PLACE.

GRAPHOPHONE-MANDREL.

SPECIFICATION forming part of Letters Patent No. 629,534, dated July 25, 1899.

Application filed October 31, 1898. Serial No. 695,007. (No model.)

To all whom it may concern:

Be it known that I, RUDOLF WOLF, a subject of the Emperor of Germany, residing at Bridgeport, county of Fairfield, State of Connecticut, have invented a new and useful Graphophone-Mandrel, of which the following is a specification.

My invention relates in general to machines for recording and reproducing sounds—as, for example, the machines known to the trade as “graphophones” and “phonographs”—and has for its object to provide a mandrel or device for carrying the cylinders which may be produced at much less cost than any mandrel heretofore placed upon the market, which while lighter than the various mandrels now in use shall be amply strong to meet any possible requirements of use, and which shall be so constructed that all truing up of the mandrels to adapt them for use and hand-labor in finishing them shall be wholly done away with. With these ends in view I have devised the novel graphophone or phonograph mandrel of which the following description, in connection with the accompanying drawings, is a specification, reference characters being used to designate the several parts.

Figure 1 is an elevation of my novel mandrel; Fig. 2, a section thereof, the shaft being in elevation; and Fig. 3 is an end elevation as seen from the right in Fig. 2.

A denotes the shaft, which is simply a rod, and may or may not be turned down at the end, as at 1.

B denotes the mandrel proper—that is, the cylindrical carrier upon which the sound recording and reproducing cylinders are placed in use—the mandrels being ordinarily slightly tapering, as shown in the drawings.

2 denotes a sleeve which adheres tightly to the shaft; 3, a head formed integral with the mandrel and the sleeve, whereby said mandrel and sleeve are located concentrically,

and 4 denotes wings formed integral with the mandrel, sleeve, and head, whereby the mandrel is braced and strengthened and the mandrel and shaft are rigidly and permanently secured in their proper positions relatively to each other.

In practice I form the mandrel, sleeve, head, and wings and at the same time rigidly and permanently secure said parts to the shaft by casting them in one piece and upon the shaft, the parts of the mold being suitably shaped to give the exact contour required to the exterior surface of the mandrel and head, and the pieces comprising the core being so shaped as to hold the shaft concentrically in the mold and to give the desired shape to the sleeve and wings when the molten metal is poured into the mold.

I have found in practice that by casting mandrel, sleeve, head, and wings upon a shaft secured concentrically in the mold I am enabled to produce a mandrel that will require no truing up, as it will run true in the condition in which it comes from the mold and in which the various operations of hand-finishing heretofore found necessary may be wholly dispensed with.

Having thus described my invention, I claim—

A mandrel of the character described comprising a cylinder-carrier, a sleeve, a head, and wings connecting the sleeve and carrier, all composed of integral cast metal, and a shaft one end of which is located in said sleeve, and the latter being secured in place by casting thereon.

In testimony whereof I affix my signature in presence of two witnesses.

RUDOLF WOLF.

Witnesses:

A. M. WOOSTER,
S. V. HELEY.

No. 629,963.

Patented Aug. 1, 1899.

P. H. HOLM.
GRAMOPHONE.

(Application filed Aug. 25, 1898.)

No Model.)

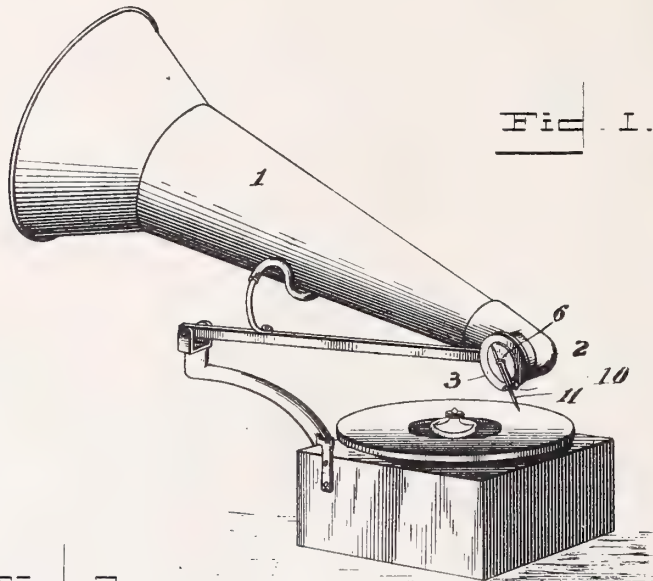


Fig. 2.

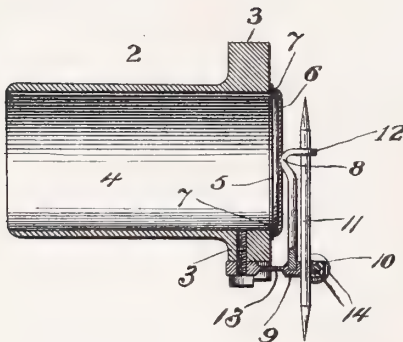
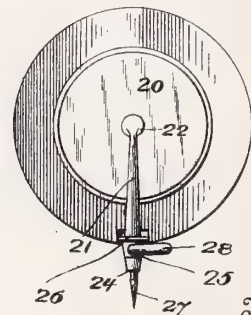


Fig. 3.



Witnesses:
Fenton S. Belt,
Joseph Kelly.

Inventor:
Peter H. Holm
By *C. J. Belt*
Attorney.

UNITED STATES PATENT OFFICE.

PETER H. HOLM, OF WARREN, MINNESOTA.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 629,963, dated August 1, 1899.

Application filed August 25, 1898. Serial No. 689,491. (No model.)

To all whom it may concern:

Be it known that I, PETER H. HOLM, a citizen of the United States, residing at Warren, in the county of Marshall and State of Minnesota, have invented certain new and useful Improvements in Gramophones, of which the following is a specification.

This invention relates to gramophones, and particularly to a sound-reproducing diaphragm and means for elastically holding the diaphragm not in or on a sound-box, but on the sound-nipple, thereby making a direct vibration.

The object of the invention is to provide a diaphragm free from or with no direct attachment to the nipple-head of a sounding-tube, said diaphragm having a sharp wedge-shaped inturned bearing peripheral edge forming its only contact-surface.

A further object of the invention is to provide a new and novel means for elastically holding the diaphragm on the nipple-head, such means also constituting the stylus holder or carrier.

The sounds reproduced by the diaphragms heretofore known are accompanied with a disagreeable squeaking, reedy, or buzzing effect, owing to so much of the diaphragm lying on the sound-tube nipple-head. My diaphragm, with its inturned sharp peripheral edge affording the least contact-surface, has been found to entirely prevent such disagreeable and unnatural effects and to reproduce a clearly-vibrated pure tone or sound by direct vibration over the whole area of the sound-tube opening. The direct vibration of the diaphragm is made by having the latter cover the whole area of the opening in the nipple-head, there being no intervening sound-box and said opening being the same size of the nipple.

In the accompanying drawings, forming part of this application, Figure 1 is a perspective view of my invention. Fig. 2 is an enlarged sectional view. Fig. 3 is an elevation of a modified form of the stylus-arm shown in Figs. 1 and 2.

The same reference-numerals denote the same parts throughout the several figures of the drawings.

In lieu of the usual sound-box I provide a headed nipple, which consists of a hollow piece or pipe, having at one end an enlargement or surrounding flange forming a head, over which a diaphragm is operated and over the other end of which a sound-tube is fitted, so that the nipple forms a coupling between the sound-tube and the diaphragm.

The sound-tube 1 is placed on the nipple 2, which has a thick solid flange forming a head 3, an opening 4 direct through the nipple and head, and a rubber or other suitable gasket 5 on the head.

The sound-reproducing diaphragm 6 is composed, preferably, of thin metal, though glass may be used, and has a beveled or wedge-shaped inturned periphery, which forms a sharp or knife-like edge bearing 7, which is the only bearing or contact between the gasket 5 and the diaphragm. The diaphragm is held in a vibratory position over the opening 4 by a stylus-arm 8, secured at one end to the center of the diaphragm, and the other end is secured to or formed integral with a stylus-support 9, which has one end attached to the head 3 and the other end formed into a fork or U-shaped carrier 10 for one end of the stylus 11, the other end of the stylus being carried by the upturned end 12 of the stylus-arm 8. The said two ends of the stylus-support are joined by a spring 13, preferably integral with said ends. A set-screw 14 is operated through one of the arms of the U-shaped carrier to adjust and hold the stylus in any desired position. The stylus is made double-pointed, so that it may be turned end for end should occasion demand. It is obvious that this stylus, either single or double, is for rubber records, either disk or cylindrical, and may be retracted to leave a shorter length of stylus upon the outside of its carrier, so as to louden or strengthen the sound, and when it is desired to reduce the volume or soften the sound the stylus is extended a greater length beyond its carrier.

It will be seen that the stylus-arm is attached directly to the center of the diaphragm and the latter is not attached to the nipple-head, thus permitting a free action of the diaphragm independent of the said head and

vibrated directly from the point of the stylus through the spring and stylus-arm, the bearing-surface of the diaphragm being so slight, yet equal throughout, that a clear pure tone
5 is produced.

Referring to Fig. 3, a stylus 15 for cutting or grooving a wax record, whether in disk or cylindrical form, is shown and has a spring-arm 16 attached to the center of the diaphragm
10 17 at one end, and the other end is secured to a nipple-head.

In Fig. 3 the diaphragm 20 is the same as that already treated; but the stylus-arm 21 has a downwardly-turned end 22, secured to
15 the center of the diaphragm 20, and the other end is enlarged and hollow and terminates in an open top 24 of the support 25, which has a spring 26, the stylus 27 being adjusted in the hollow end of the arm 21 by a set-screw 28.

20 It will be observed that the diaphragm is almost equal in diameter to the opening of the sound-tube, so that the full volume of sound will be imparted to the tube by the direct vibration of the diaphragm over the whole
25 area of the tube end.

Having thus described my invention, what I claim is—

1. The combination, with the nipple having a head, of a sound-reproducing diaphragm comprising a disk, the only contact-surface
30 between it and the said head being at the juncture of the inner and outer faces of the disk.

2. A sound-reproducing diaphragm comprising a disk having a beveled or inturned
35 periphery forming a sharp bearing.

3. The combination, with a sound-tube nipple provided with a suitable gasket, of a diaphragm comprising a disk having a sharp edge forming the only contact with the gasket, a
40 stylus-arm secured at one end to the center of the disk, and the stylus-support in which the other end of the said arm terminates.

In witness whereof I hereunto set my hand in the presence of two witnesses.

PETER H. HOLM.

Witnesses:

P. O. DAHLGREN,
P. B. MALBERG.

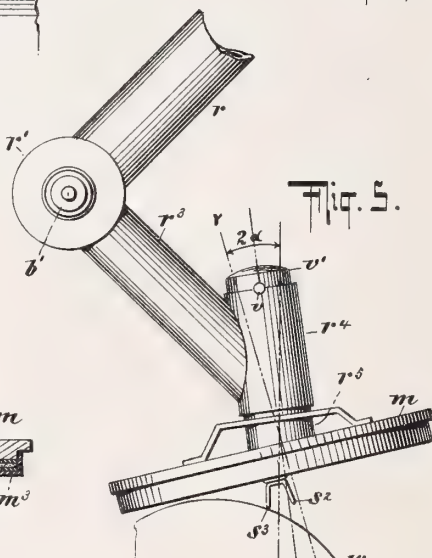
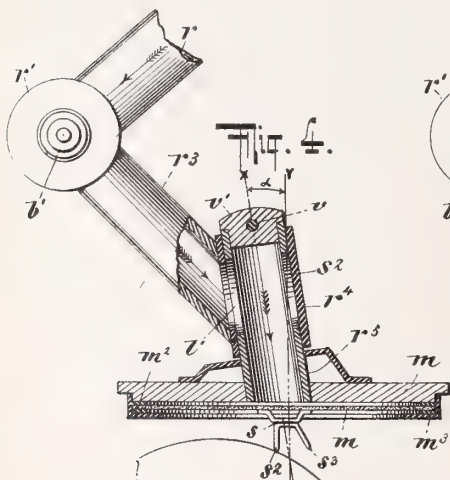
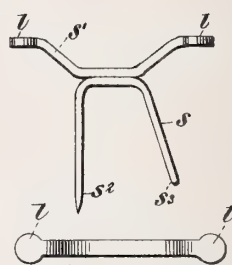
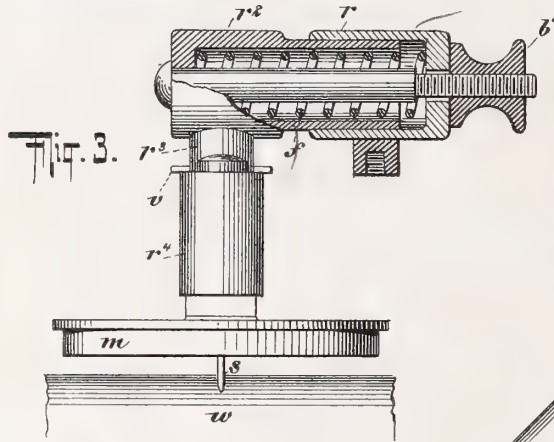
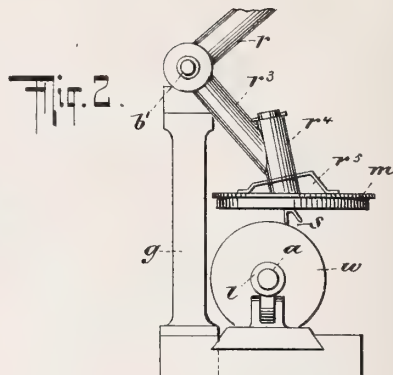
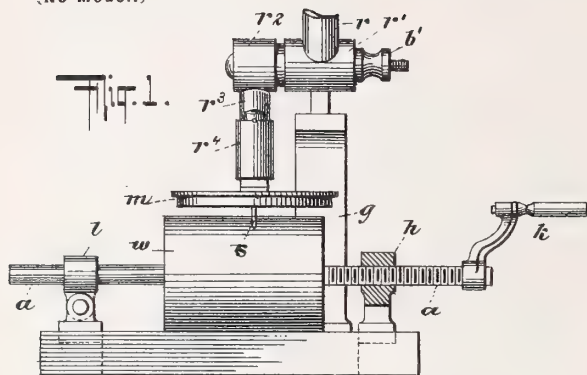
No. 630,521.

Patented Aug. 8, 1899.

J. SCHOENNER.
TOY PHONOGRAPH.

(Application filed Jan. 24, 1899.)

(No Model.)



WITNESSES:

Gustav Kietnick
S. Th. Th. Th.

INVENTOR

BY

Brissin & Knauth
ATTORNEYS

UNITED STATES PATENT OFFICE.

JEAN SCHOENNER, OF NUREMBERG, GERMANY.

TOY PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 630,521, dated August 8, 1899.

Application filed January 24, 1899. Serial No. 703,247. (No model.)

To all whom it may concern:

Be it known that I, JEAN SCHOENNER, manufacturer, a resident of Nuremberg, Bavaria, German Empire, have invented certain new and useful Improvements in Toy Phonographs, of which the following is a specification.

This invention has for its object to simplify the construction of phonographs, so as to produce a cheap structure suitable for use as a toy. For this object the two speaking devices employed for receiving and giving off the conversation are combined into a bifurcated diaphragm-pin, which is immovably fixed on the under side of the diaphragm. In order that the said diaphragm-pin may be utilized according to requirements, sometimes for receiving or recording and sometimes for delivering or reproducing the conversation, a section of the resonance or sound tube, on the under side of which the diaphragm, together with the diaphragm-pin, is fixed, is movably arranged and may be turned about one hundred and eighty degrees. By this means the diaphragm-pin is brought into two different positions in such a way that it may serve as a receiving or recording pin in one position and as a delivering or reproducing pin in the opposite position when turned about one hundred and eighty degrees. By giving the diaphragm and pin a suitable form and angular arrangement relative to the revoluble section of the sound-tube the result is attained that the diaphragm-pin, as will be hereinafter explained, assumes each time the necessary position relative to the phonograph-cylinder as is requisite on the one hand for the correct recording and on the other hand for the clear reproduction of the speech.

The arrangement is shown in the accompanying drawings, in which—

Figure 1 is a side elevation, and Fig. 2 an end view, of the toy as a whole. Fig. 3 is an enlarged partly-sectional view of the sound-regulating chamber. Fig. 4 is an enlarged detail view showing the diaphragm and pin in position for reproducing. Fig. 5 is a similar view showing the diaphragm shifted into proper position for recording. Fig. 6 is an enlarged detail view of the bifurcated or double-pointed diaphragm-pin.

The spindle *a* of the phonograph-cylinder *w*

is mounted at both ends in bearings *l h* and has one end screw-threaded to engage an internal thread in one of the bearings, by means of which the phonograph-cylinder is slowly displaced in an axial direction upon the spindle being turned by a handle *k*. The sound or resonance tube serves for receiving and giving off the speech, and the speaking appliances are fixed on a frame *g*, and during the reception of speech the sound travels through the sound-tubes *r r' r² r³ r⁴* to the diaphragm-box *m* and sets in vibration the diaphragm, which is arranged on the under side of said box. On this diaphragm there is fixed a diaphragm-pin *s*, the point of which encounters the upper surface of the phonograph-cylinder, and thereby, according to the vibrations of the diaphragm, certain impressions on the cylinder are made in the ordinary way.

The special arrangement which renders it possible to utilize the same diaphragm-pin *s* both for receiving and also for reproducing the speech is shown in Figs. 4, 5, and 6. The said pin, which is shown separately on an enlarged scale in Fig. 6, is formed as a bifurcated pin, the upper part serving for attaching the pin to the diaphragm. The pin *s* is so shaped that one end, *s²*, forms a rounded point and is therefore suitable for reproducing speech, while the other end, *s³*, is formed as a graver of a suitable form for impressing the conversation on the phonograph-cylinder. According to requirements this diaphragm-pin may be brought into the position for receiving or giving off a conversation by means of the following arrangement: It is fixed by its upper part by means of a U-shaped bridge-piece *s'*, held by means of two fastening-pieces *l* onto the glass diaphragm, which is clamped onto the bottom of the diaphragm-box *m* between two india-rubber rings *m² m³*. In the position for reproducing speech shown in Fig. 4 the diaphragm-pin has its rounded point *s²* resting on the phonograph-cylinder *w*. By means of the arrangement shown in Figs. 3 to 5 the pin may be brought, as desired, into the reproducing or the recording position. In order that the other end, *s³*, of the pin may be brought into contact with the phonograph-roller for the purpose of recording a speech, the diaphragm-box *m* is not directly attached to the hinged part *r⁴* of the

sound-tube, but to a tube or spindle r^5 , which is loosely movable within the socket or tube r^4 on the same and projects from the latter at the top. The common axis xx of these
 5 two tubes is inclined at a given angle α from the vertical axis yy of the diaphragm-box and the diaphragm-pin. The movable tube r^5 is prevented from falling out of the socket-tube r^4 by means of a pin v , which projects
 10 at both sides at the upper end v' and engages in a tiny groove formed on the upper edge of the socket-tube r^4 . By this means the proper position of the movable tube r^5 , diaphragm-box m , and diaphragm-pin s is determined.
 15 When the pin is to be brought into the receiving or recording position, it is only necessary to turn the movable tube r^5 within the socket-tube r^4 to one hundred and eighty degrees, so that the index-pin v again rests in
 20 the slot or groove. By this means the axis yy of the diaphragm-box comes into the position shown in Fig. 5, in which it, together with the diaphragm-pin s , incloses an angle, such as 2α . Simultaneously the end s^3 of the
 25 diaphragm-pin which serves for recording speech comes in contact with the phonograph-cylinder and in consequence of its inclined position assumes a suitable position for recording the speech or sound. The movable
 30 tube r^5 , which is revoluble in the socket-tube r^4 , may, if necessary, be provided with two side slots lying diametrically opposite one another in order to allow the sound-waves from the sound-tube r^3 to pass through to the
 35 diaphragm at each of the two positions.

By turning the diaphragm-tube one hundred and eighty degrees, as above pointed out, the point s^2 of the diaphragm-pin is brought in contact with the phonograph-cyl-
 40 nder and into a position where its axis and the axis of the sound-tubes r^4 r^5 correspond. It is then in a proper position for reproducing.

In order to regulate the sound when reproducing speech, the horizontal part r^2 of the
 45 sound-tube, as shown in Fig. 3, is arranged telescopically extensible in the tube r' , so that the course which the sound-waves describe within the sound-tube may be increased or diminished. In order to exactly regulate this,
 50 a spring f is arranged within the tube-sections r' and r^2 , which spring tends to force apart the two sections, and a screwed nut b' is placed on a threaded bolt b , which runs right through the tube-sections r' r^2 , whereby

the latter may be telescopically adjusted 55 against one another by simply turning the said nut. The tube r^2 is provided with a slot corresponding with the end of the tube r , so that the adjustment of the tube r^2 will not interfere with the passage of the sound-waves. 60

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a phonograph, the combination with 65 a cylinder of a diaphragm mounted upon a spindle inclined with respect to the diaphragm and the axis thereof, a bifurcated pin mounted upon the diaphragm and having one of its shanks substantially parallel to the axis of the diaphragm and the other of its said shanks 70 disposed with respect to the said diaphragm at an angle substantially equal to double the angle of inclination between the axis of the diaphragm and the axis upon which the said 75 diaphragm is carried.

2. In a phonograph, the combination of a diaphragm, or spindle carrying the said diaphragm and inclined with respect to the diaphragm and to the true axis thereof and a 80 double-pointed stylus adapted for recording and reproducing carried by the diaphragm and in such relation thereto that upon rotating the diaphragm upon its spindle, one point may be shifted away from contact with 85 the phonograph-cylinder and the other point brought into contact with the phonograph-cylinder, substantially as described and for the purposes set forth.

3. In an acoustic apparatus, the combination 90 of a plurality of cylindrical sound-tubes r^2 r' which telescope one within the other and are arranged axially with respect to each other, a spring f and regulating-nut b' for the purpose of effecting a shifting of the sound-tubes, 95 a tube r leading into one of the said sound-tubes and a tube r^3 leading from the other of the said sound-tubes, whereby there is provided intermediate of the tubes r r^3 a joint 100 or axially-adjustable inclosed space for modifying the character of the sound-waves in the tubes r r^3 .

In witness whereof I have hereunto set my hand in presence of two witnesses.

JEAN SCHOENNER.

Witnesses:

ANDREAS SLID,
 OSCAR BOCK.

No. 630,869.

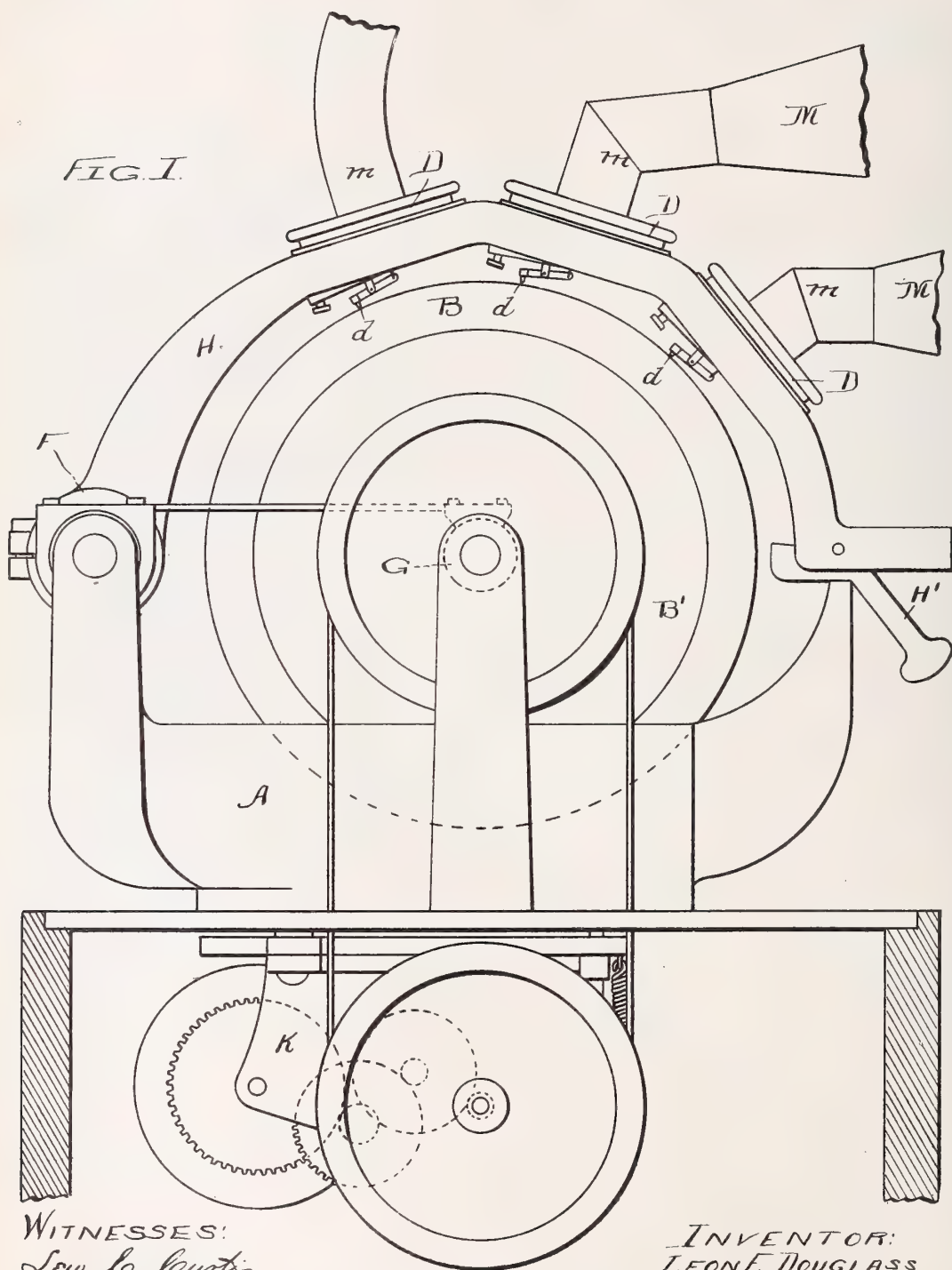
Patented Aug. 15, 1899.

L. F. DOUGLASS.
TALKING MACHINE.

(Application filed May 11, 1899.)

(No Model.)

2 Sheets—Sheet 1



WITNESSES:

Low. C. Curtis
A. W. Munday,

INVENTOR:
LEON F. DOUGLASS

BY Munday, Curtis & Leacock
HIS ATTORNEYS

No. 630,869.

Patented Aug. 15, 1899.

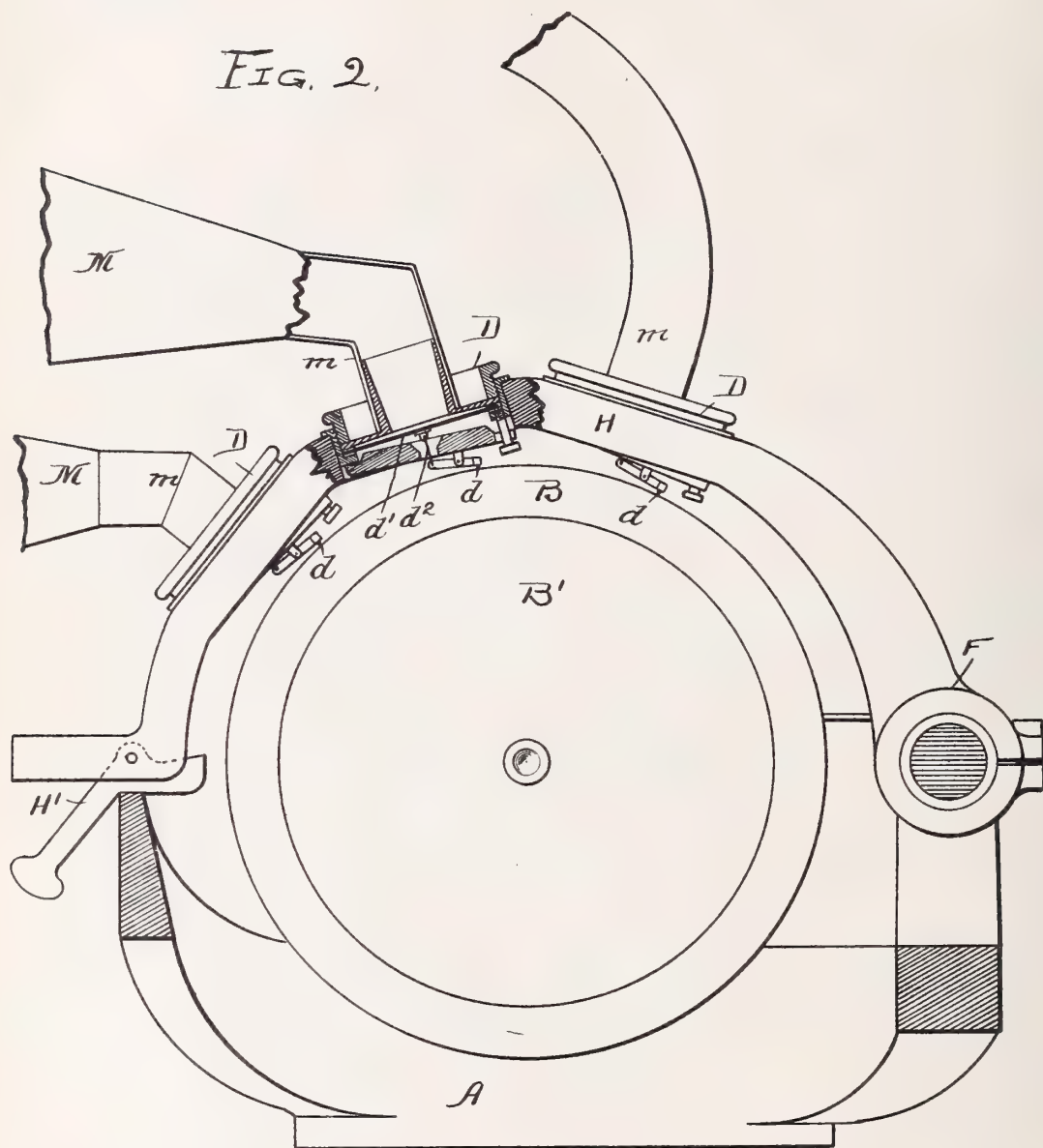
L. F. DOUGLASS.
TALKING MACHINE.

(Application filed May 11, 1899.)

(No Model.)

2 Sheets—Sheet 2.

FIG. 2.



WITNESSES:

Geo. C. Curtis
A. W. Munday

INVENTOR:
LEON F. DOUGLASS

By Munday, Watts & Adams

HIS ATTORNEYS

UNITED STATES PATENT OFFICE.

LEON F. DOUGLASS, OF CHICAGO, ILLINOIS, ASSIGNOR TO CHARLES DICKINSON, OF SAME PLACE.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 630,869, dated August 15, 1899.

Application filed May 11, 1899. Serial No. 716,341. (No model.)

To all whom it may concern:

Be it known that I, LEON F. DOUGLASS, a citizen of the United States, residing in Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Talking-Machines, of which the following is a specification.

My invention relates to improvements in talking-machines.

10 In talking-machines, phonographs, or graphophones heretofore generally in use wherein the sound is recorded upon and reproduced from a blank or cylinder of wax-like composition of about two inches in diameter rotating at a speed of about one hundred or one hundred and twenty revolutions per minute the speech, vocal music, instrumental music, or other sounds recorded and reproduced have been faint and defective and lacking in volume, loudness, clearness, distinctness, and naturalness, being generally accompanied with a harsh and disagreeable frying noise, and many attempts have heretofore been made to remedy such defects. One material
25 improvement made and patented to me in Letters Patent of the United States No. 613,670, of November 8, 1898, and which is now commonly known as the "polyphone," consists in combining with the rotating sound-record blank or cylinder two or more reproducers, with reproducing-points or styli tracking one after another in the same sound-record groove, the interval or space between them being so short that both reproducers reproduce the
35 same sounds substantially simultaneously, thus doubling or multiplying the volume, clearness, and perfection of the reproduction. Another improvement, operating on a different principle, which I have made and upon
40 which I have filed application for patent in the United States consists, essentially, in combining with a single reproducer a sound-record cylinder or blank of two or three times the diameter heretofore generally used and
45 rotating at substantially the same high speed of one hundred or one hundred and twenty revolutions per minute previously employed for the small or two-inch sound-record cylinder, thus doubling or trebling the surface
50 speed at which the sound-record groove en-

gages the reproducing-point or stylus, and so increasing the force or intensity of the blows exerted upon the diaphragm of the reproducer as to render the sounds reproduced many times louder and clearer, indeed to a
55 surprising extent and so that they can be distinctly heard at a considerable distance. I have discovered that by constructing a single unitary machine or apparatus combining these two principles or modes of operation, so that they mutually cooperate and
60 each complements and reinforces the other, speech, vocal music, instrumental music, and other sounds may be reproduced in a very surprising manner and very greatly superior in
65 point of volume, loudness, clearness, distinctness, and naturalness to the results produced either by my polyphone or my large cylinder machine and that the reproduction can by this new means be distinctly heard at a distance of several hundred feet.

My invention consists in the means I employ to accomplish this new and useful result—that is to say, it consists in the combination, with a sound-record cylinder of large diameter, preferably of about or substantially
75 six inches diameter, rotating at high speed, preferably about one hundred or one hundred and twenty revolutions per minute, of a multiplicity of reproducers arranged tandem or one after another with their styli following or tracking in the same sound-record groove and operating to reproduce simultaneously, or substantially so, the same sounds, whereby the volume, loudness, clearness, and
85 distinctness of the reproduction is very greatly increased. By reason of the large size or diameter of the sound-record cylinder I am enabled to arrange three or more reproducers in cooperative position about the upper half of the sound-record cylinder, while the greatly-increased surface-speed of the cylinder causes the several styli of the sound-reproducers to be operated by the same portion of the sound-record at such very short
90 intervals of time between as to be wholly inappreciable to the ear, thus giving the effect of a single stylus or reproducer in respect to simultaneousness, while securing the effect of the several reproducers in respect to vol- 100

ume, &c., and at the same time also accomplishing the result due to the large size of the cylinder and its rapid speed upon each reproducer.

5 In the accompanying drawings, forming a part of this specification and in which similar letters of reference indicate like parts in both views, Figure 1 is an end elevation of a talking machine or apparatus embodying my invention, and Fig. 2 is a vertical section.

10 In said drawings, A represents the frame of the machine. B is the sound-record cylinder of a wax-like composition, the same as those heretofore in use on graphophones or phonographs, excepting that it is of a large size of 15 from two to three times the diameter of those heretofore commonly in use—that is to say, it is from four to six inches in diameter.

20 D D D are a series of reproducers arranged tandem or one after another, so that their reproducing-points or styli *dd* follow or track one after another in the same sound-record groove and are separated from each other by only a short distance or space.

25 F is the feed slide or carriage, upon which the several reproducers D D D are mounted and by which they are all fed or moved together simultaneously from one end of the sound-record cylinder to the other by the feed-screw G, said feed-slide having a curved 30 hinged arm H by which the reproducers D D D may be raised or lifted out of contact with the sound-record cylinder B by the lifting-lever H'.

35 K is a spring or other motor by which the sound-record cylinder B or its shaft or mandrel B' is rotated at a uniform high speed of about one hundred or one hundred and twenty revolutions per minute.

40 M M M are horns or sound-conveying devices connecting with the several reproducers. Their inner ends *m m m* are preferably curved or bent, so that the horns may all have the same general direction notwithstanding 45 the curvature of the arm H upon which the reproducers are carried.

The reproducers D may be of any suitable construction familiar to those skilled in the art. Each, however, preferably comprises a 50 reproducing-point or stylus *d* and diaphragm *d'*, with suitable connections *d''* between the stylus and diaphragm.

I claim—

55 1. The combination with a large sound-record cylinder of wax-like composition of sub-

stantially from four to six inches diameter, of a motor for rotating said sound-record cylinder at a high speed of substantially one hundred to one hundred and twenty revolutions per minute, and two or more reproducers arranged tandem or one after another, the stylus or reproducing-point of one following 60 another in the same sound-record groove, substantially as specified.

2. The combination with a large sound-record cylinder of wax-like composition of substantially from four to six inches diameter, of a motor for rotating said sound-record cylinder at a high speed of substantially one hundred to one hundred and twenty revolutions per minute, and two or more reproducers arranged tandem or one after another, the stylus or reproducing-point of one following 70 another in the same sound-record groove, and a feed slide or carriage having a curved hinged arm encircling the upper half of the sound-record cylinder upon which said reproducers are mounted, substantially as specified. 75

3. The combination with a series of reproducers arranged tandem or one after another, 80 of a sound-record cylinder of large diameter rotating at high speed sufficient in connection with the large diameter of the sound-record cylinder to cause the sound-record groove to engage the stylus of each reproducer at such 85 high speed, substantially one hundred and fifty feet per minute as to individually reproduce the sound recorded upon the record with great volume, clearness and distinctness, and to engage the series of styli of the series of 90 reproducers at such short intervals of time as to produce the effect upon the ear of substantially simultaneousness, substantially as specified.

4. The combination with a series of reproducers arranged tandem or one after another, 95 of a sound-record cylinder engaging the reproducing-points or styli of said reproducers at a surface speed of substantially from one hundred to one hundred and fifty feet per 100 minute, whereby the sounds are reproduced with great volume, loudness, clearness of quality and distinctness, and with substantial simultaneousness in respect to the operation of all the reproducers, substantially as 105 specified.

LEON F. DOUGLASS.

Witnesses:

H. M. MUNDAY,
L. E. CURTIS.

No. 631,558.

Patented Aug. 22, 1899.

J. CHANIA.
PHONOGRAPH.

(Application filed Sept. 14, 1898.)

(No Model.)

Fig: 1.

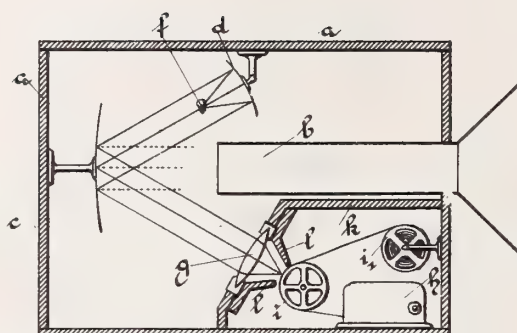
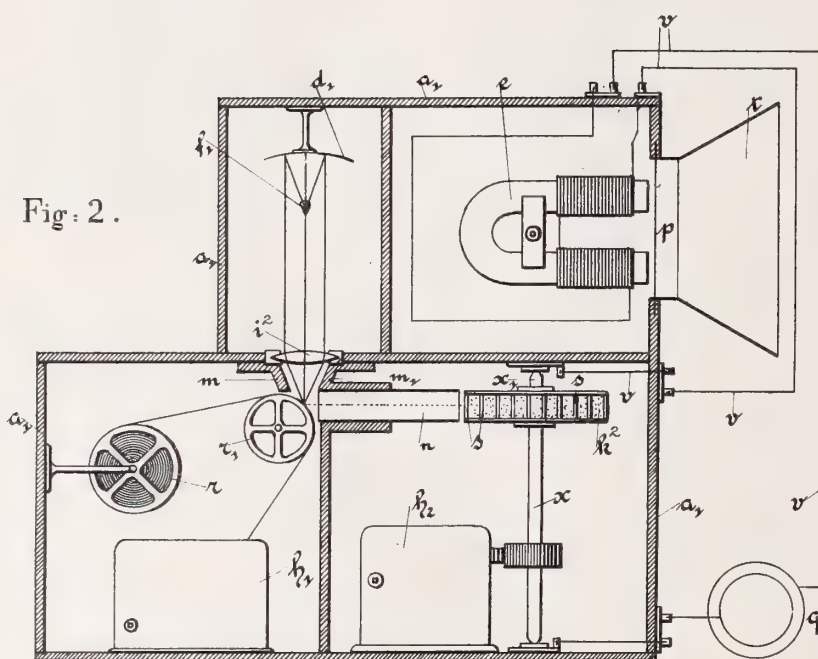


Fig: 2.



WITNESSES:

Wm. S. Bell.
Louise Snyder.

INVENTOR :

Josef Chania

BY

Partnes & Howard
ATTORNEYS

UNITED STATES PATENT OFFICE.

JOSEF CHANIA, OF LEMBERG, AUSTRIA-HUNGARY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 631,558, dated August 22, 1899.

Application filed September 14, 1898. Serial No. 690,904. (No model.)

To all whom it may concern:

Be it known that I, JOSEF CHANIA, a subject of the King of Roumania, residing in Lemberg, Galicia, Austria-Hungary, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

The object of this invention is to provide an apparatus whereby sounds of any kind may be recorded through the medium of light-rays which are so controlled relatively to the waves of sound that they are subjected to the influence of the latter and their intensity more or less varied and whereby the recorded matter may be subsequently delivered, also through the medium of light-rays, under whose influence there is an electric circuit controlling a sound-transmitting diaphragm.

In view of the foregoing objects the first part of the invention consists in an apparatus whereby a record is made of the variations in intensity of light-rays, said variations being effected by the action of sound-waves, and the second part of the invention consists in an apparatus whereby the recorded matter is delivered through the medium of light-rays and an electrically-controlled sound-transmitting diaphragm under the influence of said light-rays.

In the accompanying drawings, Figure 1 is a sectional view of an apparatus embodying the first part of my invention, and Fig. 2 is a similar view of an apparatus embodying the second part of my invention.

In said drawings, referring particularly to Fig. 1, *a* designates a case wherein is arranged a tube *b*, which penetrates one of the side walls of said case and which is provided at its outer end with a suitable mouthpiece.

c indicates a reflector which is disposed in alinement with the inner end of the tube *b*, being preferably secured to the opposite wall of the case, and which is of such character that sound-waves thrown against it from the tube *b*, whereby they are transmitted into the apparatus, will effect sufficiently appreciable vibrations thereof to produce the desired results.

d designates another reflector, which is (if desired, adjustably) secured to a third wall of the case in such a position that a light thrown

upon it can be reflected therefrom to the reflector *c*.

f designates a source of light which is so disposed that its rays can be thrown upon the reflector *d* and from thence transferred to the reflector *c*, where they will be again reflected.

k represents a partition which is arranged in said case *a* and which forms a compartment therein distinct from the main portion of said case. The compartment thus formed is situated in line with the rays which are thrown from the reflector *c*, and the wall adjacent to said reflector is inclined substantially at right angles to the line of said rays and is provided with an orifice wherein is arranged a lens *g*, through which said rays are adapted to pass and whereby they are focused.

h is a small case wherein is contained a sensitized strip similar to that used for photographic purposes, said strip being passed over an auxiliary roller *i* and being adapted to be ultimately wound upon a roller *i'*. It should be remarked that the auxiliary roller *i* is so disposed relatively to the lens *g* that the focus of the rays from said lens will be coincident with the sensitized surface of the strip passing over said auxiliary roller. In order that no light may leak into the compartment wherein is contained the sensitized strip, a conical shield *l* is secured to the inclined wall of the partition about the opening formed therein for the lens and projects into contiguity to said strip.

It will be seen that in the use of the apparatus just described and constituting the first part of my invention light-rays will be ultimately transmitted from the source of light *f* onto the sensitized strip in concentrated condition and that the desired record may be produced on said sensitized strip by sound-waves which may be thrown onto the reflector *c*, intercepting to a more or less extent the light-rays which coincidentally therewith meet the reflector and effecting vibratory action of said reflector, the result being variations in the action of the light-rays focused onto the sensitized strip.

In the apparatus constituting the second part of my invention I have provided a case *a'*, comprising, preferably, four compartments, one of which is in communication, as and for

the purposes hereinafter described, with two of the others. In one of said compartments is placed a reflector d' , which is situated in opposition to an opening therein that communicates with another compartment. In said opening is situated a lens i , and between said lens and the reflector d' is suitably arranged a source of light f' .

In the compartment between which and the one just described is disposed the lens i a casing h' is situated, said casing being adapted to receive the sensitized strip upon which the record has been placed by the apparatus constituting the first part of my invention and which is fed from a roller r over an auxiliary roller r' , the latter being arranged in proximity to the lens i^2 and so that the rays of light passing through the latter will be focused by it onto the sensitized strip and in coincidence with the matter thereon recorded.

A conical shield m is arranged about the opening for the lens, said conical shield being provided for the same purpose as the similar device hereinbefore described. Said conical shield may comprise a portion of the partition between the compartment containing the sensitized strip and another compartment not heretofore particularly referred to, said partition having an opening for the reception of a tube n , and said opening and the tube being so situated that any light reflected off of the surface of the sensitized strip may be transmitted through said tube into the compartment adjoining the one in which the sensitized strip is arranged and with which said tube communicates.

x x' designate a divided arbor, which is journaled in the compartment last particularly referred to and which is rotated by any suitable mechanism, as by clockwork h^2 . Said arbor carries a sheave k , which comprises a pair of disks, between which are disposed concentrically a series of strips or blocks of selen k^2 , which are supported by insulations s . The sheave just referred to is so disposed relatively to the tube n that light transmitted through said tube will be successively thrown onto the selen strips as the arbor is rotated. It should be further remarked that the disks of the sheave k are respectively carried by the divided portions of the arbor.

v designates an electrical circuit having a source of electrical energy at q and including the divided arbor x x' and the sheave k and an electromagnet e , which is situated in the fourth compartment of the case. Said electromagnet is adapted to control a diaphragm p , which constitutes the armature thereof and which is situated in an opening formed in an outer wall of said compartment.

t denotes a funnel-shaped shell surrounding the opening wherein the diaphragm p is arranged, said shell being provided for an obvious purpose.

In view of the above description of the apparatus constituting the second part of my invention it will be seen that the light thrown

from the reflector d' through the lens i^2 and by the latter concentrated on the record will be reflected off the surface of said sensitized strip and thrown onto the selen strips of the revolving sheave. The variations in the record will effect variations in the action of the rays on the revolving selen strips, and consequently produce in them a greater or less resistance to the electric current in the circuit of which said strips form a part, according to the well-known quality of selen under the action of light. The variations in the electric current will effect the intermittent energization of the electromagnet e , whereupon the diaphragm p will be actuated and sounds produced.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a sound-recording apparatus, the combination with a source of light, a movable sensitized body, a vibratory reflector adapted to transmit the rays of light from the source thereof to the sensitized body, and means for projecting sound-waves onto said reflector at points coincident with the points of impact of the light-rays therewith, substantially as described.

2. In a sound-recording apparatus, the combination of a source of light, a movable sensitized body, a vibratory reflector adapted to transmit the rays of light from the source thereof to the sensitized body, a lens disposed between said vibratory reflector and said sensitized body and adapted to concentrate the rays on the latter, and means for projecting sound-waves onto said reflector at points coincident with the points of impact of the light-rays therewith, substantially as described.

3. In a sound-delivering apparatus, the combination with a source of light, a suitable body having the record to be delivered on its surface, and an electric circuit including a sounding device and a series of variable resistance devices, the light being adapted to be transmitted from its source onto the record and thence to the variable resistance devices, substantially as described.

4. In a sound-delivering apparatus, a source of light, a suitable body having the record to be delivered on its surface, and an electric circuit including a sounding device and a strip or strips of selen, the light being adapted to be transmitted from its source onto the record and thence to the selen strip or strips, substantially as described.

5. In a sound-delivering apparatus, a source of light, a suitable body having the record to be delivered on its surface, an electric circuit including a sounding device and a series of selen strips, the light being adapted to be transmitted from the record toward said selen strips, and means for moving said selen strips successively across the path of the light, substantially as described.

6. In a sound-delivering apparatus, a source of light, a suitable body having the record to be delivered on its surface, a reflector for

transmitting the light from its source onto
said body in coincidence with the record, a
lens disposed between said reflector and said
body and adapted to concentrate the rays of
5 light, an electric circuit, a divided arbor in-
cluded in said circuit and having suitable ro-
tating means, selen strips operatively dis-
posed between the portions of said arbor and
radially arranged with respect thereto, said
10 selen strips being in the line of reflection of
the light from said body, an electromagnet

also included in said circuit, and a sound-
producing diaphragm controlled by said elec-
tromagnet, substantially as described.

In witness whereof I have hereunto signed 15
my name, this 28th day of July, 1898, in the
presence of two subscribing witnesses.

JOSEF CHANIA.

Witnesses:

HENRY C. CARPENTER,
RD. HERBERT RUST.

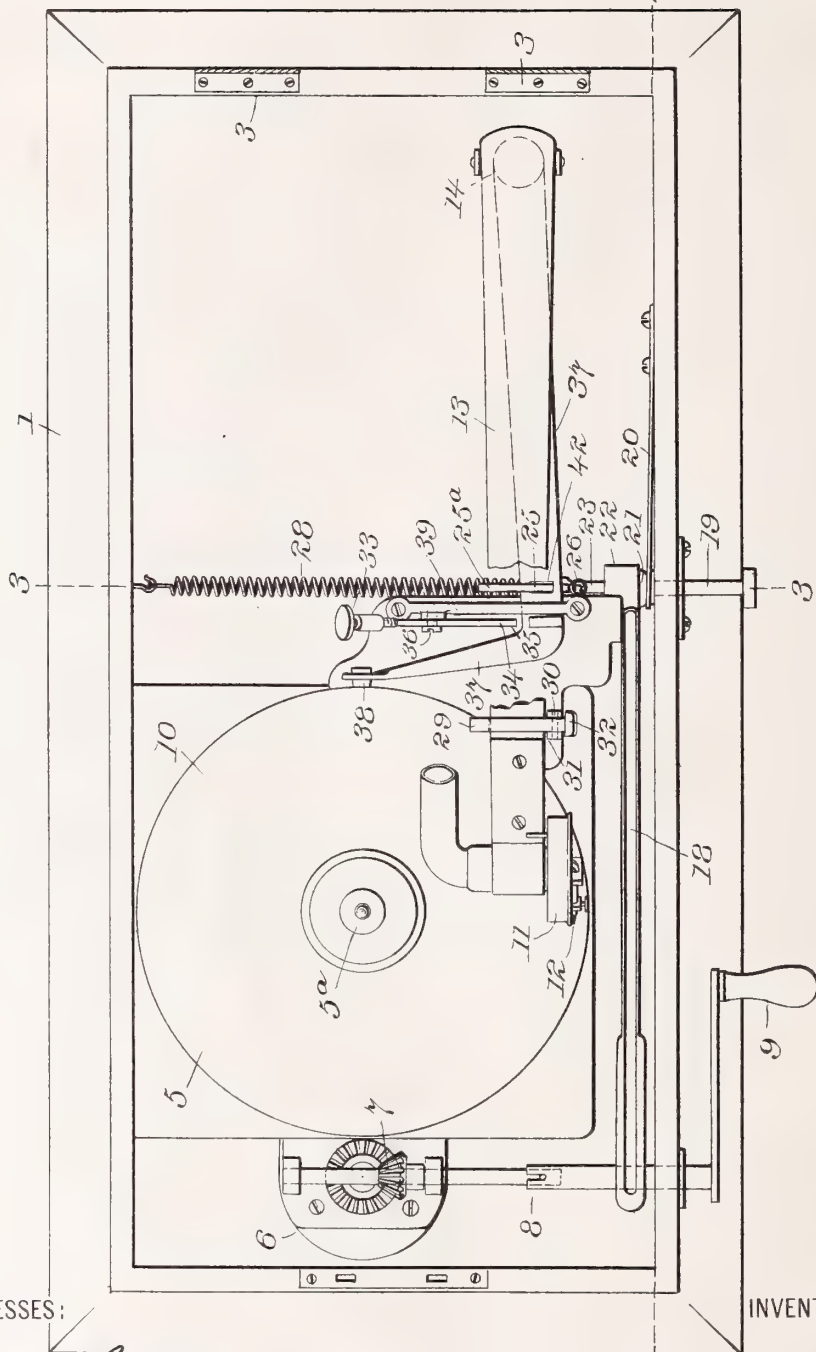
L. P. VALIQUET.
COIN OPERATED MECHANISM.

(Application filed Oct. 28, 1898.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

INVENTOR

Ernest W. Hall
N. H. Humphrey.

Louis P. Valiquet
BY *A. P. Berdine*
ATTORNEY

No. 631,911.

Patented Aug. 29, 1899.

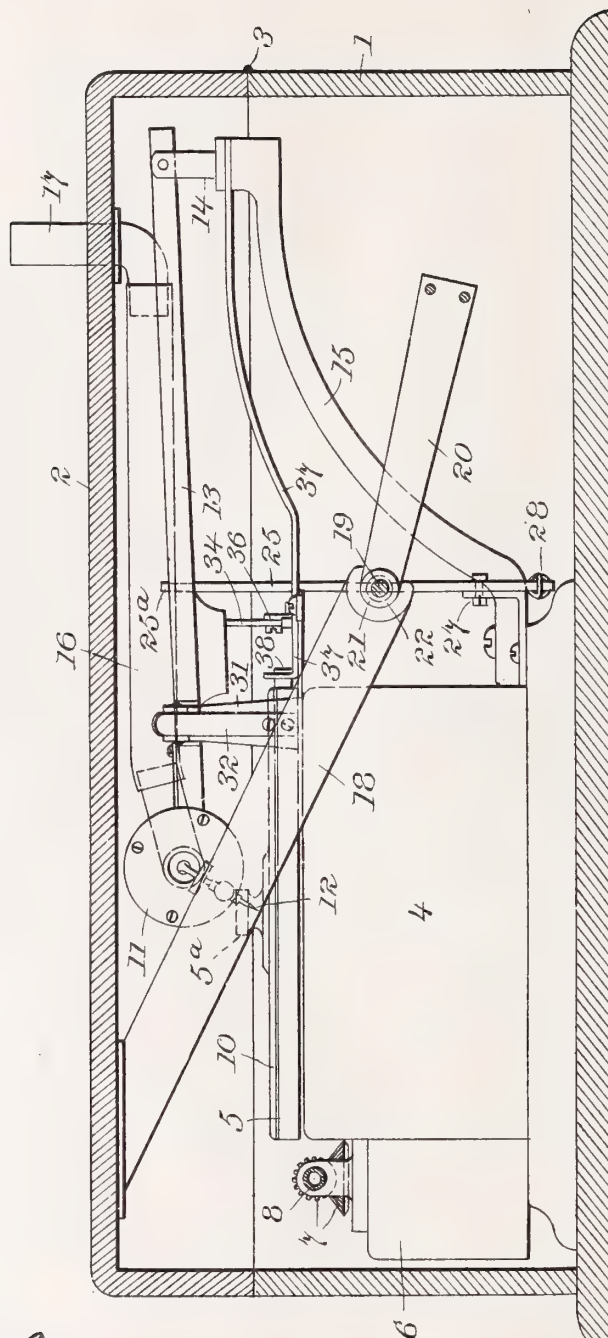
L. P. VALIQUET.
COIN OPERATED MECHANISM.

(Application filed Oct. 28, 1898.)

(No Model.)

4 Sheets—Sheet 2.

Fig. 2.



WITNESSES:

Ernest Platt.

H. H. Humphrey.

INVENTOR

Louis P. Valiquet

BY

A. W. Herdman

ATTORNEY

L. P. VALIQUET.
COIN OPERATED MECHANISM.

(Application filed Oct. 28, 1898.)

(No Model.)

4 Sheets—Sheet 3.

Fig. 4.

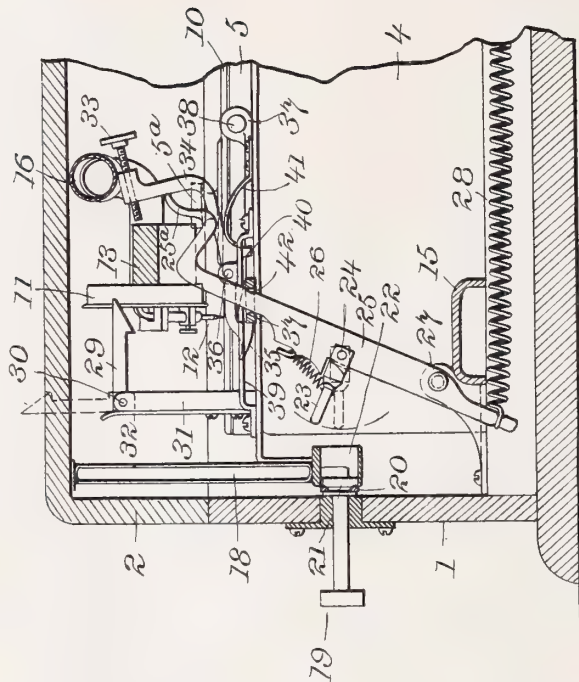
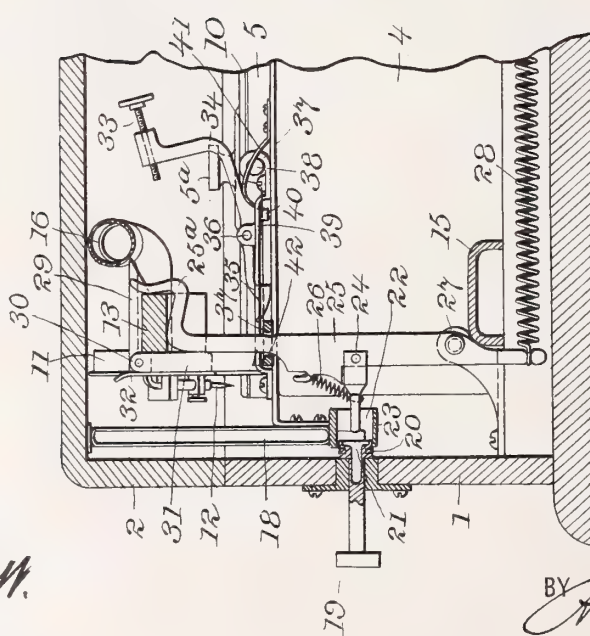


Fig. 3.



WITNESSES:

Ernest Mann

H. H. Humphrey

INVENTOR

Louis P. Valiquet

BY

A. Parker Smith

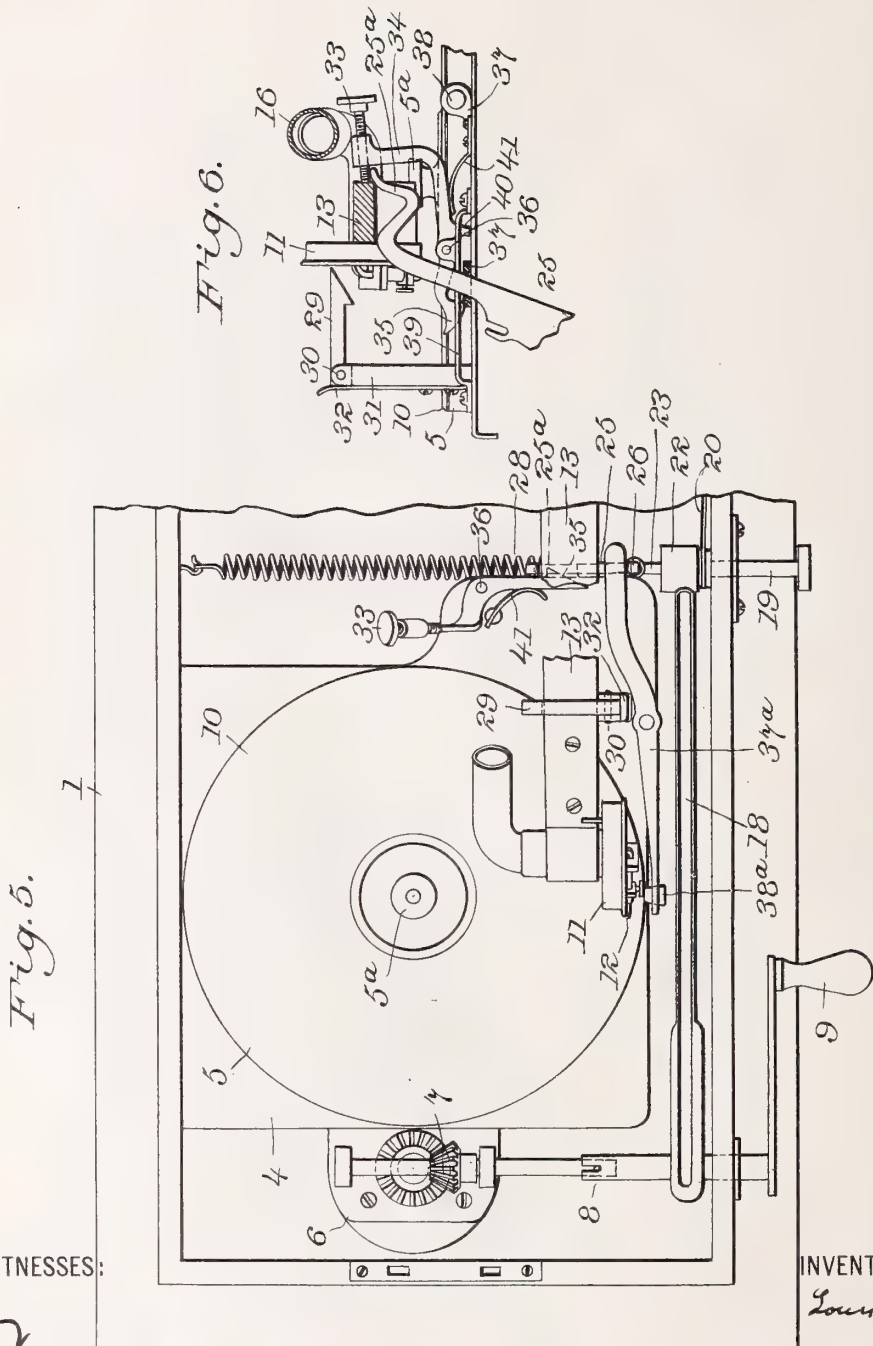
ATTORNEY

L. P. VALIQUET.
COIN OPERATED MECHANISM.

(Application filed Oct. 28, 1898.)

(No Model.)

4 Sheets—Sheet 4.



WITNESSES:

Ernest Watt.
J. H. Humphrey.

INVENTOR

Louis P. Valiquet

BY

A. Van der Smith
ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL TALKING MACHINE COMPANY, OF NEW YORK.

COIN-OPERATED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 631,911, dated August 29, 1899.

Application filed October 28, 1898. Serial No. 694,824. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, New York county, New York State, have invented certain new and useful Improvements in Coin-Operated Mechanisms, of which the following is a specification.

My invention relates to coin-operated devices generally, and is more specifically designed to produce a coin-operated mechanism for automatically operating what is known as the "gramophone."

My invention is an improvement on the apparatus heretofore constructed having a worm-screw or other slow-acting return-feed, and is designed to produce a mechanism giving a quicker return of the needle-carrying arm to its initial position and greater certainty of operation, while at the same time reducing the number of parts, and consequently simplifying and cheapening the construction.

The preferred form of apparatus embodying my invention is illustrated in the accompanying four sheets of drawings, in which—

Figure 1 is a plan view of the apparatus with the top of the case containing the same removed and a portion of the needle-carrying arm broken away. Fig. 2 is a vertical section on line 2 2 of Fig. 1. Fig. 3 is a partial section on lines 3 3 of Fig. 1, showing the needle-carrying arm in its initial position and the mechanism at rest. Fig. 4 is a similar section showing the gramophone in operation, the parts being in the position occupied by them just before the return mechanism is tripped into operation. Fig. 5 shows a modified form of brake-lever. Fig. 6 is a diagrammatic detail showing the retaining device just after it has been tripped and the return mechanism released and starting into operation to return the needle-carrying arm to the initial position shown in Fig. 3.

Throughout the drawings like reference figures refer to like parts.

I have shown the gramophone and attached mechanism in a casing 1, having a hinged cover 2, attached to the casing by hinges 3 3 at one end. A sliding or other form of movable cover might of course be employed.

The gramophone has the ordinary form of

base 4, containing rotating mechanism, (not shown,) on which the rotating table 5 is mounted. A spring-motor of any desirable form (not shown) is located in the addition 6 to said gramophone-base. This motor is wound up by means of bevel-gears 7, a shaft 8, and winding-handle 9, the latter being outside of the casing 1. On the rotating table is the ordinary gramophone-record 10, clamped thereon by a thumb-screw 5^a in the usual manner, so as to rotate therewith. On this record rests the reproducing-needle 12 of the sound-box 11, carried by the swinging arm 13, said arm being mounted by a universal joint 14 on the pivot-bracket 15, fastened to the gramophone-base, all in the usual and well-known manner when the machine is in operation and reproducing sounds from the record.

16 is a piece of tubing, of rubber or other flexible material, extending from the sound-box 11 to the elbow-shaped tube 17, which extends through the cover of the surrounding casing and to which an ordinary horn may be connected.

There is a U-shaped coin-chute 18 extending from beneath a slot in the cover 2 to the cylindrical coin-guide 22 at right angles to said chute. In line with this coin-guide is the coin-pusher 19, normally held back by the plate-spring 20 or equivalent elastic device. On the end of this pusher and sliding in the coin-guide is the cup-shaped end 21 of the said coin-pusher, and in line with the axis of this cup and the coin-guide is the operating-plunger 23. This operating-plunger is preferably pivoted on the lever 25 by means of the pivoted joint 24, and the spring 26 normally holds said plunger at right angles to said lever 25. This lever 25 is pivoted on the bearings 27 in the bottom of the case 1 and controlled by the spring 28, so that its upper hook-shaped end 25^a is against the swinging arm 13 and under the same when the said arm is in its initial position against the stop 31. The pivoted catch 29, mounted on the stop 31 by the pivotal joint 30 and controlled by the back spring 32, overhangs and engages with the swinging arm 13 when the latter is supported in its initial position by the spring-controlled hook-shaped lever 25 in the manner above described.

The lever 25 engages with a horizontally-swinging brake-lever 37, pivoted on the end of the bracket 15 and carrying the brake-shoe 38, which engages the rotating table 5 when the spring-controlled lever 25 is in the position shown in Fig. 3 to hold up the needle-carrying arm 13. This engagement is preferably secured by passing the lever 25 through a slot 42 in the said brake-lever.

A modified construction is shown in Fig. 5, in which the brake-lever 37 is removed, and a lever 37^a is pivoted on the gramophone-base, one end of the lever carrying the brake-shoe 38^a, while the other end is struck by the spring-controlled lever 25 (upon its return) to apply the brake. In this case the guide 39 is also dispensed with.

34 is a retaining device in the form of a dog, pivoted at 36 and having a nose 35 arranged to slide over and grasp the brake-lever 37, thereby retaining the same and the lever 25 in a position out from under the needle-carrying arm.

33 is an adjustable screw mounted in the tail of the dog 34 and located in the line of travel of the needle-carrying arm 13 as the same is fed along by the sound-record during the operation of the machine.

41 is a spring tending to hold the dog 34 down in engagement with the brake-lever 37, and 40 is a lug on the dog 34, projecting down in the path of the brake-lever 37 and so located with reference to the pivot 36 of said dog that when the brake-lever strikes the lug it positively pulls the nose of the dog 35 down behind the brake-lever, thus assisting the action of the spring 41.

39 is a guide for the brake-lever.

The operation of my invention is as follows: The cover 2 of the casing being closed and the parts of the mechanism being in the position shown in Figs. 1 and 3, the operator first winds up the spring-motor by means of the handle 9 and then drops a coin down the coin-chute 18. He then forces in the coin-pusher 19, which drives the coin along the coin-guide 22 against the operating-plunger 23. This forces the spring-controlled lever 25 to the right, Figs. 3 and 4, the operating-plunger 23 turning on its pivot, so as to remain in line owing to the expansion of the spring 26. As the spring-controlled lever 25 goes over, it carries with it the brake-lever 37 until the latter has passed under the nose 35 on the retaining-dog 34, which immediately slips down behind said brake-lever. When the operator removes pressure from the coin-pusher 19, the spring 20 forces the same out and withdraws its cup-shaped end 21 from the coin, which latter drops into the box. The operating-plunger 23 being thereby released is drawn upward by the spring 26 from the dotted position shown in Fig. 4 to the position shown in full lines at right angles to the lever 25. When the hook-shaped supporting end 25^a is forced over to the right, as above described, the swinging arm 13 is prevented from traveling

with it by the pivoted spring-catch 29. When the hook-shaped lever has passed out from under the swinging arm, the latter is free to drop down, and the reproducing-needle 12 engages with the record 10. The brake-shoe 38 having been withdrawn from the rotating table 5 by the first motion of the lever 25, said table and record carried thereby are already in rotation by the time the reproducing-needle comes down on the record and the gramophone begins to operate, reproducing sound, which is delivered through the tube 17. As the needle and sound-box are fed across the record by the action of the same in the well-known way, the swinging arm 13 travels toward the adjustable screw 33, mounted in the tail of the dog 34. Said screw is so adjusted that the arm will strike it when the needle has reached the end of the record. A slight further movement of the swinging arm depresses the rear portion of dog 34 against the spring 41 and lifts the nose 35 of the dog 34 from behind the brake-lever 37, as shown in Fig. 6. The spring 28 immediately acts to force said lever 25 back into the position shown in Fig. 3. On the way the hook-shaped end 25^a picks up the needle-arm 13 and carries it back under the spring-catch 29 and holds it there in its initial position ready for a repetition of the operation. The same movement of the lever 25 has forced the brake-shoe 38 up against the rotating table 5 and stops the rotation of the same. It has also readjusted the operating-plunger 23 in line with the cup-shaped end 21 of the coin-pusher 19 ready for the operation of another coin.

It is evident that in the absence of a coin no motion of the coin-pusher 19 will have any effect on the mechanism, because the plunger will simply pass into the interior of the cup and the lever 25 will not be moved. Also it is evident that if the coin-pusher 19 be forced in and withdrawn with great rapidity, so that under ordinary circumstances the brake-lever 37 might be forced back again by the spring 28 before the retaining device could recover from the shock and the violent throwing up of the nose 35 of the dog and respond under the action of spring 41 to seize and retain said brake-lever, the very fact of the rapid movement of the parts thus described will carry the brake-lever beyond its normal travel up against the lug 40 and so positively pull the dog 34 down into operative position and insure the retention of said brake-lever and connected parts in the position shown in Fig. 4 until tripped by the needle-carrying arm at the end of a complete operation of the gramophone.

The advantages of my invention result from the certainty of operation under all conditions, from the simplicity and cheapness of the apparatus employed, and from the rapidity of the return-feed action, which is practically instantaneous. It is also extremely convenient of manipulation, as by throwing up the pivoted catch 29 into the position shown in

dotted lines in Fig. 4 the needle-carrying arm can be lifted out of engagement with the hook 25^a and swung to one side for changing the records, putting in a new needle, and making other adjustments.

It is evident that various changes could be made in the details of the apparatus described without departing from the spirit and scope of my invention, so long as the general relative arrangement of parts shown in the drawings and the general principle of operation set forth in the specification are preserved. Weights might be substituted for springs and other forms of moving parts might be substituted for the levers, the coin might throw the parts into operation through other agencies than that of external pressure on the coin-pusher of the particular kind described, &c.; but all these variations I consider within the general scope of my invention.

While certain features of the above-described apparatus are shown and herein claimed in connection with coin-operated mechanism, it is evident that certain of such features could be employed without coin-actuated connections.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a coin-operated device the combination of a swinging arm, a stop and catch for said arm, a spring-controlled lever which normally holds the arm against the stop under the catch, and coin-controlled means for pushing said lever out from under said arm, whereby said arm drops away from the catch, substantially as described.

2. In a coin-operated device the combination of a swinging arm, a stop and catch for said arm, a spring-controlled lever which normally holds the arm against the stop and under the catch, and coin-controlled means for pushing said lever out from under said arm, whereby said arm drops away from the catch, together with a retaining device which holds said lever out from under the arm, substantially as described.

3. In a coin-operated device the combination of a swinging arm, a stop and catch for said arm, a spring-controlled lever which normally holds the arm against the stop and under the catch, and coin-controlled means for pushing said lever out from under said arm, whereby said arm drops away from the catch, together with a retaining device which holds said lever out from under the arm, an automatic feed mechanism with which the swinging arm engages when dropped down, and a trip for the retaining device located in the path of the arm, substantially as described.

4. In combination with a gramophone, a lever which returns the reproducing-needle to its initial position after the operation of the

gramophone and supports said needle in such position out of engagement with the record, and coin-operated means for forcing the lever out from under the needle-carrying arm, substantially as described.

5. In combination with a gramophone, a lever which returns the reproducing-needle to its initial position after the operation of the gramophone and supports said needle in such position out of engagement with the record, and coin-operated means for forcing the lever out from under the needle-carrying arm, together with mechanism for forcing the lever back under and into engagement with the needle-carrying arm, substantially as described.

6. In combination with a gramophone, a lever which returns the reproducing-needle to its initial position after the operation of the gramophone and supports said needle in such position out of engagement with the record, and a spring which normally holds said lever under and in engagement with the needle-carrying arm, together with coin-operated means for forcing said spring-controlled lever out from under said needle-carrying arm, substantially as described.

7. In combination with a gramophone, a lever which returns the reproducing-needle to its initial position after the operation of the gramophone and supports said needle in such position out of engagement with the record, and a spring which normally holds said lever under and in engagement with the needle-carrying arm, together with coin-operated means for forcing said spring-controlled lever out from under said needle-carrying arm, and a retaining device for holding said spring-controlled lever out of engagement with the needle-carrying arm, substantially as described.

8. In combination with a gramophone, a lever which returns the reproducing-needle to its initial position after the operation of the gramophone and supports said needle in such position out of engagement with the record, and a spring which normally holds said lever under and in engagement with the needle-carrying arm, together with coin-operated means for forcing said spring-controlled lever out from under said needle-carrying arm, a retaining device for holding said spring-controlled lever out of engagement with the needle-carrying arm, and a trip for said retaining device located in the path of the needle-carrying arm, substantially as described.

Signed by me at New York city, New York, this 15th day of October, 1898.

LOUIS P. VALIQUET.

Witnesses:

LILIAN FOSTER,

A. PARKER-SMITH.

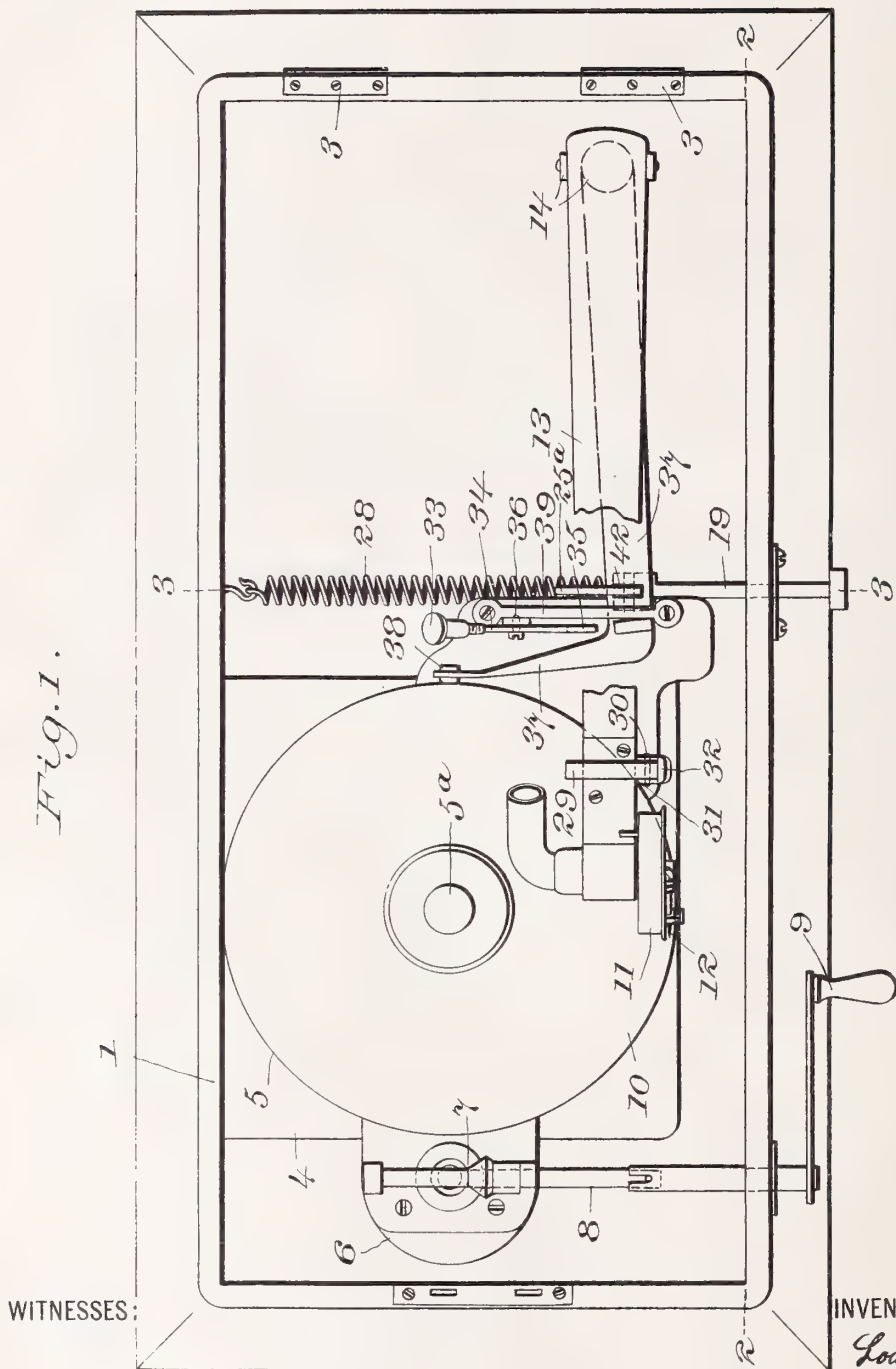
L. P. VALIQUET.
AUTOMATIC GRAMOPHONE.

(Application filed Apr. 6, 1899.)

(No Model.)

5 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

INVENTOR

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W. H. Smith
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No. 631,912.

Patented Aug. 29, 1899.

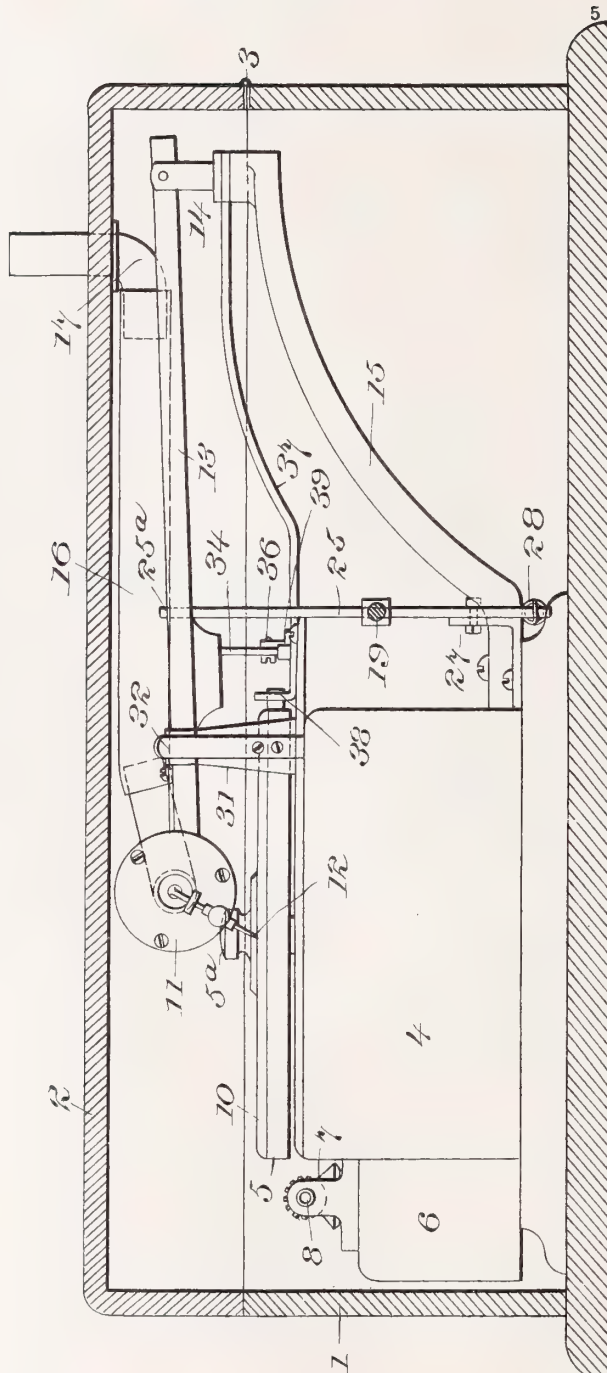
L. P. VALIQUET.
AUTOMATIC GRAMOPHONE.

(Application filed Apr. 6, 1899.)

(No Model.)

5 Sheets—Sheet 2.

Fig. 2.



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AUTOMATIC GRAMOPHONE.

(Application filed Apr. 6, 1899.)

(No Model.)

5 Sheets—Sheet 3.

Fig. 3.

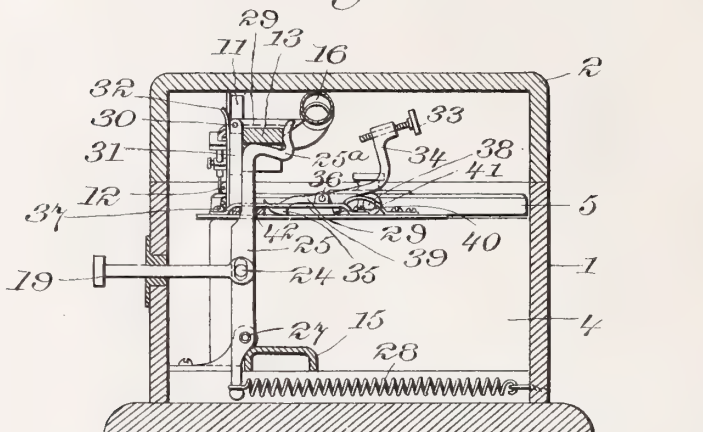
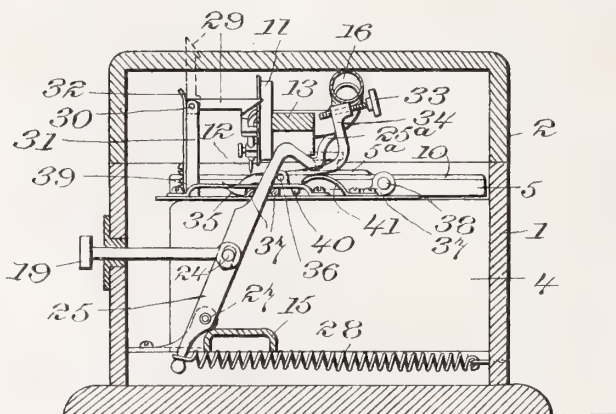


Fig. 4.



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AUTOMATIC GRAMOPHONE.

(Application filed Apr. 6, 1899.)

(No Model.)

5 Sheets—Sheet 4.

Fig. 5.

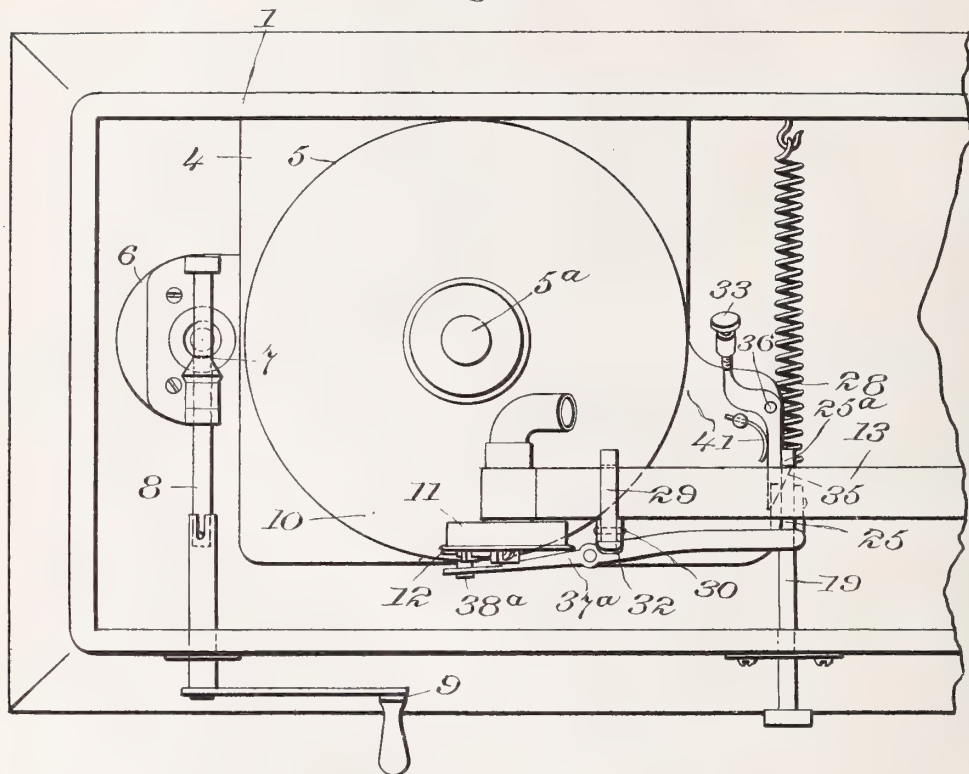
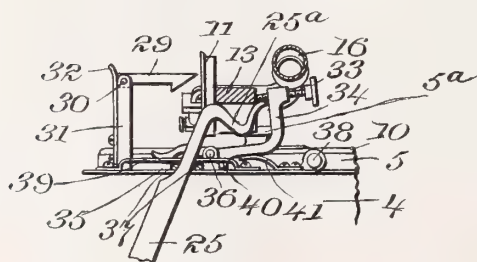


Fig. 6.



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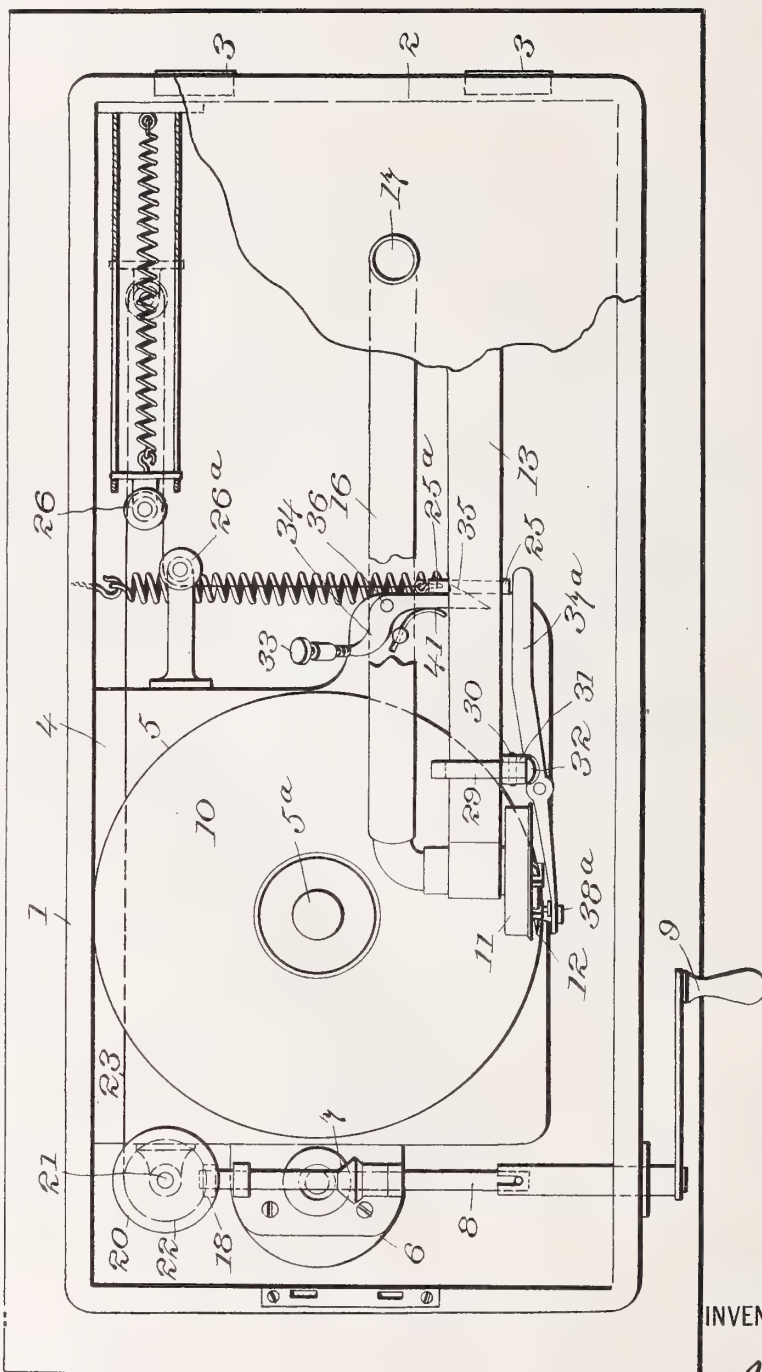
L. P. VALIQUET.
AUTOMATIC GRAMOPHONE.

(Application filed Apr. 6, 1899.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 4.



WITNESSES:

INVENTOR

Lillian Foster
N. H. Humphrey.

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Harold Smith
ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y.

AUTOMATIC GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 631,912, dated August 29, 1899.

Application filed April 6, 1899. Serial No. 711,899. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, New York county, State of New York, have invented certain new and useful Improvements in Automatic Gramophones, of which the following is a specification.

My invention relates to automatically-operating devices generally, and is more specifically designed to produce a mechanism for automatically operating what is known as the "gramophone."

My invention has many of the features of construction and principles of operation described in my application, Serial No. 694,824, filed October 28, 1898, but is designed to be thrown into operation by means other than coin-operated mechanism.

The preferred form of apparatus embodying my invention is illustrated in the accompanying five sheets of drawings, in which—

Figure 1 is a plan view of the apparatus with the top of the case containing the same removed and a portion of the needle-carrying arm broken away. Fig. 2 is a vertical section on line 2 2 of Fig. 1. Fig. 3 is a section on lines 3 3 of Fig. 1, showing the needle-carrying arm in its initial position and the mechanism at rest. Fig. 4 is a similar section showing the gramophone in operation, the parts being in the position occupied by them just before the return mechanism is tripped into operation. Fig. 5 shows a modified form of brake-lever. Fig. 6 is a diagrammatic detail showing the retaining device just after it has been tripped and the return mechanism released and starting into operation to return the needle-carrying arm to the initial position shown in Fig. 3. Fig. 7 shows a modification in which the winding up of the motor sets and trips the mechanism.

Throughout the drawings like reference-figures refer to like parts.

I have shown the gramophone and attached mechanism in a casing 1, having a hinged cover 2, attached to the casing by the hinges 3 3 at one end. A sliding or other form of movable cover might of course be employed.

The gramophone has the ordinary form of base 4, containing rotating mechanism, (not shown,) on which the rotating table 5 is

mounted. A spring-motor of any desirable form (not shown) is located in the addition 6 of said gramophone-base. This motor is wound up by means of bevel-gears 7, a shaft 8, and winding-handle 9, the latter being outside of the casing 1. On the rotating table is the ordinary gramophone-record 10, clamped thereon by a thumb-screw 5^a in the usual manner, so as to rotate therewith. On this record rests the reproducing-needle 12 of the sound-box 11, carried by the swinging arm 13, said arm being mounted by a universal joint 14 on the pivot-bracket 15, fastened to the gramophone-base, all in the usual and well-known manner, when the machine is in operation and reproducing sounds from the record.

16 is a piece of tubing of rubber or other flexible material extending from the sound-box 11 to the elbow-shaped tube 17, which extends through the cover of the surrounding casing and to which an ordinary horn may be connected.

The pusher 19 is normally held back by the spring 28 or equivalent elastic device. This pusher is preferably connected to the lever 25 by means of the pin-and-slot connection 24. This lever 25 is pivoted on the bearings 27 in the bottom of the case 1 and so controlled by the spring 28 that its upper hook-shaped end 25^a is against the swinging arm 13 and under the same when the said arm is in its initial position against the stop 31. The pivoted catch 29, mounted on the stop 31 by the pivotal joint 30 and controlled by the back spring 32, overhangs and engages with the swinging arm 13 when the latter is supported in its initial position by the spring-controlled hook-shaped lever 25 in the manner above described.

The lever 25 engages with a horizontally-swinging brake-lever 37, pivoted on the end of the bracket 15 and carrying the brake-shoe 38, which engages the rotating table 5 when the spring-controlled lever 25 is in the position shown in Fig. 3 to hold up the needle-carrying arm 13. This engagement is preferably secured by passing the lever 25 through a slot 42 in the said brake-lever.

A modified construction is shown in Fig. 5, in which the brake-lever 37 is removed, and a lever 37^a is pivoted on the gramophone-base,

one end of the lever carrying the brake-shoe 38^a, while the other end is struck by the spring-controlled lever 25 (upon its return) to apply the brake. In this case the guide 5 39 is also dispensed with. The spring-controlled lever 25 operates exactly as in the other construction. Instead of carrying the lever 37, however, with it in its movement it merely strikes the end of the lever 37^a, when 10 it returns the swinging needle-carrying arm to its original position, and thereby forces on the brake 38^a. Of course when the swinging lever 25 is forced out from under the needle-carrying arm it leaves the end of the brake-lever 37^a, and all pressure is removed from 15 the brake-shoe 38^a, so that the machine is free to operate.

34 is a retaining device in the form of a dog pivoted at 36 and having a nose 35 arranged to slide over and grasp the brake-lever 37, thereby retaining the same and the lever 25 in a position out from under the needle-carrying arm.

33 is an adjustable screw mounted in the tail of the dog 34 and located in the line of travel of the needle-carrying arm 13, as the same is fed along by the sound-record during the operation of the machine.

41 is a spring tending to hold the dog 34 down in engagement with the brake-lever 37, and 40 is a lug on the dog 34, projecting down in the path of the brake-lever 37 and so located with reference to the pivot 36 of said dog that when the brake-lever strikes the 35 lug it positively pulls the nose of the dog 35 down behind the brake-lever, thus assisting the action of the spring 41.

39 is a guide for the brake-lever.

The operation of my invention is as follows: The cover 2 of the casing being closed and the parts of the mechanism being in the position shown in Figs. 1 and 3, the operator first winds up the spring-motor by means of the handle 9 and then forces in the pusher 40 19, which forces the spring-controlled lever 25 to the right, Figs. 3 and 4. As the spring-controlled lever 25 goes over it carries with it the brake-lever 37, until the latter has passed under the nose 35 on the retaining-dog 34, which immediately slips down behind said brake-lever. When the operator removes pressure from the pusher 19, the spring 28 forces the lever 25 back against the nose 35 of the dog 34, which holds it in the position shown in Fig. 4. When the hook-shaped supporting end 25^a is forced over to the right, as above described, the swinging arm 13 is prevented from traveling with it by the pivoted spring-catch 29. When the hook-shaped 60 lever has passed out from under the swinging arm, the latter is free to drop down and the reproducing-needle 12 engages with the record 10. The brake-shoe 38 having been withdrawn from the rotating table 5 by the first motion of the lever 25, said table and record 65 carried thereby are already in rotation by the time the reproducing-needle comes down on

the record and the gramophone begins to operate, reproducing sound, which is delivered 70 through the tube 17. As the needle and sound-box are fed across the record by the action of the same in the well-known way the swinging arm 13 travels toward the adjustable screw 33, mounted in the tail of the dog 34. Said screw is so adjusted that the arm 75 will strike it when the needle has reached the end of the record. A slight further movement of the swinging arm depresses the rear portion of the dog 34 against the spring 41 and lifts the nose 35 of the dog 34 from behind the brake-lever 37, as shown in Fig. 6. 80 The spring 28 immediately acts to force said lever 25 back into the position shown in Fig. 3. On the way the hook-shaped end 25^a picks up the needle-arm 13 and carries it back under the spring-catch 29 and holds it there in its initial position ready for a repetition of the operation. The same movement of the lever 25 has forced the brake-shoe 38 up 90 against the rotating table 5 and stops the rotation of the same. It has also forced out the pusher 19, ready for another operation. It is evident that if the pusher 19 be forced in rapidly, so that under ordinary circumstances the brake-lever 37 might be forced 95 back again by the spring 28 before the retaining device could recover from the shock and the violent throwing up of the nose 35 of the dog and could respond under the action of the spring 41 to seize and retain said brake-lever, the very fact of the rapid movement 100 of the parts thus described will carry the brake-lever beyond its normal travel up against the lug 40 and so positively pull the dog 34 down into operative position and insure the retention of said brake-lever and 105 connected parts in the position shown in Fig. 4, until tripped by the needle-carrying arm at the end of a complete operation of the gramophone. 110

It is evident, of course, that many different agencies for setting the apparatus might be substituted for the manually-operated pusher 19. One such I have shown in Fig. 7. The shaft 8 is extended, and a friction-wheel 115 18 runs under the friction-plate 20. This plate is mounted on a vertical shaft 21, which carries the drum 22. On this drum winds the cord 23, which passes around the spring-controlled pulley 26 and the fast pulley 26^a to 120 the lever 25. When the motor in compartment 6 is wound up, the shaft 21 is revolved and cord 23 wound up. The spring-controlled pulley is in the full-lined position. The winding therefore pulls lever 25 over to the position shown in Fig. 4, and the machine is ready 125 to operate. Further winding does not break the cord 23, because the friction-wheel 18 slips under the plate 20. When the operator stops winding, the gramophone begins to operate. The cord 23 is unwound from drum 22, the slack being taken up by spring-pulley 26, which moves into dotted-line position. When the lever 25 is tripped at the 130

end of the record, and flies back to position of Fig. 3, the spring-pulley 26 gives up the necessary slack to accommodate this motion, returning to full-line position, and all is ready for a repetition of the cycle of operation. The parts are so proportioned that with the winding necessary to run the shortest record the cord 23 will be taken up the amount needed to carry the lever 25 over to catch under the dog 34. When winding for longer records, the slip in the friction connection allows for excess motion. The spring-controlling pulley 26 must of course be a weak one, just strong enough to take up the cord.

The advantages of my invention result from the certainty of operation under all conditions, from the simplicity and cheapness of the apparatus employed, and from the rapidity of the return-feed action, which is practically instantaneous. It is also extremely convenient of manipulation, as by throwing up the pivoted catch 29 into the position shown in dotted lines in Fig. 4 the needle-carrying arm can be lifted out of engagement with the hook 25^a and swung to one side for changing the records, putting in a new needle, and making other adjustments.

It is evident that various changes could be made in the details of the apparatus described without departing from the spirit and scope of my invention so long as the general relative arrangement of parts shown in the drawings or the general principle of operation set forth in the specification is preserved. Weights might be substituted for springs, and other forms of moving parts might be substituted for the levers. Other agencies might operate the lever 25, other friction-couplings be used, &c.; but all these variations I consider within the general scope of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a talking-machine the combination of the reproducing-needle and a lever which returns the reproducing-needle from its position at the end of the record to its initial position, after the operation of the talking-machine, and supports said needle in such position out of engagement with the record.

2. In a talking-machine the combination of the reproducing-needle and a lever which returns the reproducing-needle from its position at the end of the record to its initial position after the operation of the talking-machine and supports said needle in such position out of engagement with the record, together with a spring which normally holds said lever under and in engagement with the needle-carrying arm.

3. In a talking-machine the combination of the rotating table, the reproducing-needle a brake for the rotating table, a swinging needle-carrying arm, a lever which directly sup-

ports the needle-carrying arm so that the needle is held out of engagement with the record, and connections whereby the movement of the lever out from under the needle-carrying arm, releases the brake.

4. In combination with a gramophone, a lever for returning and supporting the needle-carrying arm of said gramophone, and the brake-lever for the gramophone operated by said first-mentioned lever.

5. In combination with a gramophone and the needle-carrying arm thereof, the hook-shaped lever normally supporting the needle-carrying arm of said gramophone, the pivot catch-lever overhanging the normal position of the said swinging arm when supported by the hook-shaped lever, and the back spring controlling said catch-lever.

6. In combination with a gramophone the swinging arm and reproducing-needle thereof a lever which returns the swinging arm and reproducing-needle of said gramophone to their initial position after the operation of the gramophone and supports said needle in such position out of engagement with the record, and the stop for said needle-carrying arm and overhanging spring-catch for said arm.

7. In a talking-machine the combination of the reproducing-needle, a lever which returns the reproducing-needle to its initial position after the operation of the talking-machine and supports said needle in such position out of engagement with the record, a winding-shaft for said talking-machine, and connecting means between the shaft and the first-mentioned lever.

8. In a talking-machine the combination of the winding-shaft therefor, the reproducing-needle, a lever which returns the reproducing-needle to its initial position after the operation of the talking-machine, and supports said needle in such position out of engagement with the record, a cord connected to the first-mentioned lever and means operated by the winding-shaft to wind up said cord.

9. In a talking-machine the combination of the winding-shaft therefor, the reproducing-needle, a lever which returns the reproducing-needle to its initial position after the operation of the talking-machine, and supports said needle in such position out of engagement with the record, a cord connected to the first-mentioned lever and means operated by the winding-shaft to wind up said cord, together with spring mechanism for taking up any slack in said cord.

10. In a talking-machine the combination of the reproducing-needle, a lever which returns the reproducing-needle to its initial position after the operation of the talking-machine and supports said needle in such position out of engagement with the record, a spring which normally holds said lever under and in engagement with the needle-carrying arm, means for winding up the talking-ma-

chine motor, and connections whereby said winding means moves the lever in opposition to the spring.

11. In a talking-machine the combination
5 of the reproducing-needle, a lever which returns the reproducing-needle to its initial position after the operation of the talking-machine and supports said needle in such position out of engagement with the record, a
10 spring which normally holds said lever under and in engagement with the needle-carrying

arm, a winding-shaft for the talking-machine, a cord connected to the lever, and means operated by the winding-shaft for winding up the cord in a direction to pull the lever in position to the spring. 15

Signed by me at New York city, New York, this 3d day of April, 1899.

LOUIS P. VALIQUET.

Witnesses:

A. PARKER-SMITH,
LILIAN FOSTER.

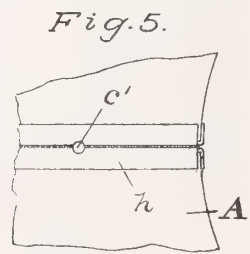
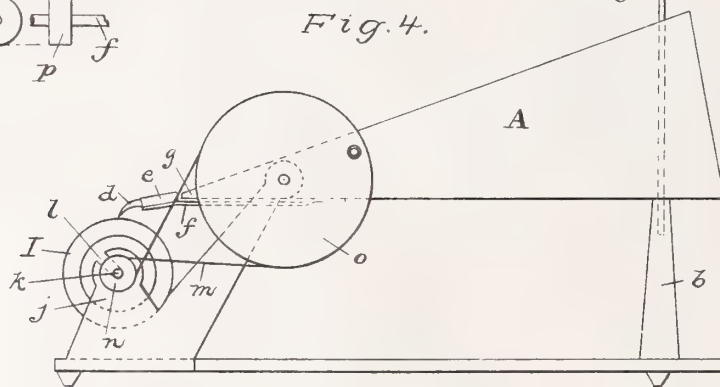
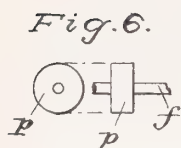
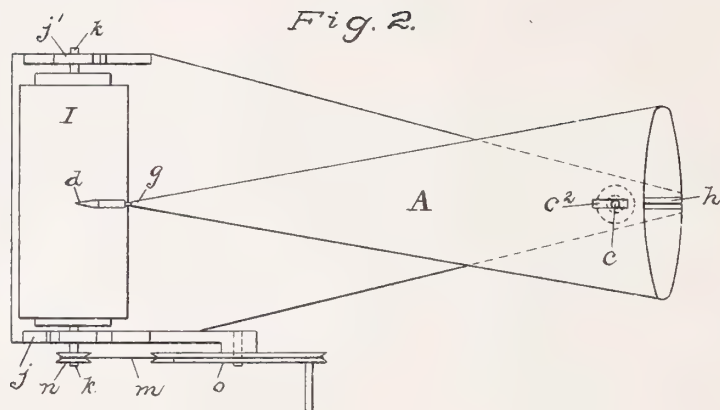
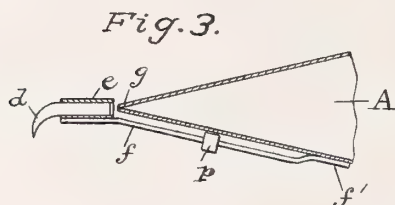
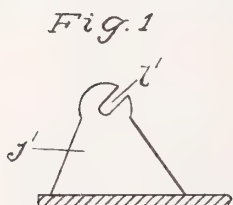
No. 632,015.

Patented Aug. 29, 1899

G. L. HOGAN.
GRAPHOPHONE.

(Application filed Apr. 15, 1899.)

(No Model.)



Witnesses:
Charles B. Mann Jr.
George Koehler.

Inventor:
George L. Hogan
By Chas B. Mann
Attorney.

UNITED STATES PATENT OFFICE.

GEORGE L. HOGAN, OF BALTIMORE, MARYLAND.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 632,015, dated August 29, 1899.

Application filed April 15, 1899. Serial No. 713,078. (No model.)

To all whom it may concern:

Be it known that I, GEORGE L. HOGAN, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Graphophones, of which the following is a specification.

My invention relates to improvements in graphophones or devices designed for reproducing articulate speech or other sounds recorded on phonograms or sound-writings.

The object of my invention is to provide a device or mechanism of a simple, cheap, and durable construction by means of which such phonograms or sound-writings may be accurately and perfectly audibly produced without any attendant disagreeable scraping, grating, or other interfering noise resulting from the action of the mechanism.

My invention consists of a sound-generator in the form of a trumpet of conical shape made of a tough quality of paper, vulcanized fiber, or other material and having a rigidly-attached small rod of hard material, the extremity of which is brought to a fine point and bent so as to fit in the spiral grooves of the phonogram-writing and pivoting said trumpet.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a sectional view of a portion of the base on which the cylinder is mounted. Fig. 2 is a top view of the machine complete. Fig. 3 is a sectional view of the point end of the trumpet on a somewhat larger scale. Fig. 4 is a side elevation of the complete machine. Fig. 5 is a detail view of part of the trumpet, showing the manner of joining its edges. Fig. 6 is a detail view of the adjustable cushion.

The large end of the trumpet A rests on a stud b, where it is pivoted loosely on a vertical rod c, extending from the stud upward. This gives the point end of the trumpet a free lateral swinging movement. The trumpet has on its lower side a hole c' and on its upper side a slot c², through which the rod passes. The longitudinal slot c² affords a slight range of up-and-down movement to the point end. A hard downward-curved point d is attached to the small end of the trumpet, and said point rests on the phonogram-cylinder, and

as the same is revolved the spiral groove of the writing serves as the means to carry the point d from one end to the other of the cylinder, the trumpet swinging on its pivot c. No other feeding or guiding device is required.

The hard point d may be attached to any portion of the wall of the sounding-trumpet and yield good results. I have, however, provided a novel means of attachment that will now be described. The hard point d is preferably held in a socket e, from which it may be removed when desired. The socket is fixed on the end of a rod f and has position in front of the point end g of the trumpet. This rod extends along below the small end of the trumpet, and its end f' is attached to the side of the trumpet some distance back from the said point end. This manner of locating the hard point d and connecting it with the side wall of the trumpet, but back from its point end g, produces the best results.

The trumpet is made of a sheet of tough paper or thin indurated fiber, and each of the two edges of this material that come together when the sheet is folded to the cone form are first bordered by a thin sheet-metal strip folded longitudinally, as shown at h in Fig. 5. This metal strip incloses the sheet edge like a clip and extends from the large end to the point end. The two metal strips are abutted together and joined by solder. This metal strip not only serves as a means of joining the sheet edges, but also serves to augment and improve the sounding qualities of the trumpet.

It is a feature of improvement in this invention to attach the end f' of the rod to which the hard point is secured to the said metal joint-strips h. Thereby the metal strips become the conductor for the sound vibrations, which latter are evenly distributed all along the wall of the trumpet. The pivot-hole c', heretofore referred to, is through this metal strip.

The phonogram-cylinder I is held in position by two bearings j j' and a horizontal axis k. The bearings are slotted out instead of being bored, so that the phonogram-cylinder can easily be lifted out of these bearings. The slots l l' in the two bearings are cut at right angles to one another and are in such a position that the force of elasticity of an

india-rubber belt *m*, connecting the pulley *n*, attached to the phonogram-cylinder, with the pulley *o* of the driving device, will keep the axis of the phonogram-cylinder always pressed firmly in the bearings, and thus produce a steady movement. By this simple means I have found that articulate speech, songs, and instrumental or other music may be reproduced from sound-writing very accurately and with great loudness, clearness, and distinctness.

It will be seen that this graphophone has a cylinder that may be rotated by any driving mechanism and a sounding-trumpet whose point end is movable along the cylinder, following the sound-writing. The point end automatically follows the spiral groove of the sound-writing, and the vibrations are transmitted to the trumpet, which generates and largely increases the volume of sound.

As the hard point *d* is held in a socket, it may be removed when worn and a new one inserted.

An adjustable cushion *p* is shown in Figs. 3 and 6, as a ring, and is mounted on the rod *f* and may be shifted along said rod. This cushion bears on the wall of the trumpet, and its varying position alters the tone or pitch of the sound.

A cylinder is shown carrying the sound-writing; but it is obvious a disk may be used instead or any shaped body to rotate.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A graphophone having in combination a rotating sound-writing; a vibratory cone-shaped sounding-trumpet pivoted to allow its

point end a free swinging movement, and also a slight vertical movement; a hard point engaging the surface of the said sound-writing in front of and in line with the point end of the trumpet but not contacting therewith and supported by a rod which extends along the outer wall of the trumpet and attached to the side thereof.

2. A sounding-trumpet for graphophones comprising a sheet of fiber folded to form a cone and the edges which come together bordered by strips of metal folded over the edges and the said metal strips united, and a hard point at the point end of the trumpet.

3. A sounding-trumpet for graphophones having a cone shape and made of fiber; a strip of thin metal extending longitudinally of said cone and secured to the trumpet; a hard point in front of the trumpet's point end but not attached thereto; and a rod supporting the said hard point and extending along the outside of the trumpet and attached to said metal strip.

4. A graphophone having a base provided with two bearings each having a slot inclining in a different direction from the other; a rotary cylinder carrying the sound-writing and having journals resting in said slotted bearings; a pulley on one journal; a drive-pulley; and a belt from the drive-pulley to the cylinder-pulley, as and for the purpose set forth.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE L. HOGAN.

Witnesses:

GEORGE KOETHER,
CHARLES B. MANN, Jr.

No. 633,226.

Patented Sept. 19, 1899.

A. BETZOLD.

SOUND REPRODUCER FOR TALKING MACHINES.

(Application filed May 18, 1898.)

(No Model.)

Fig. 1.

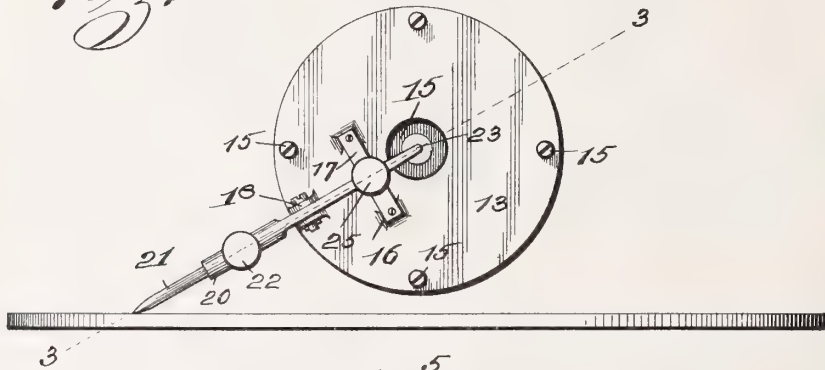


Fig. 2.

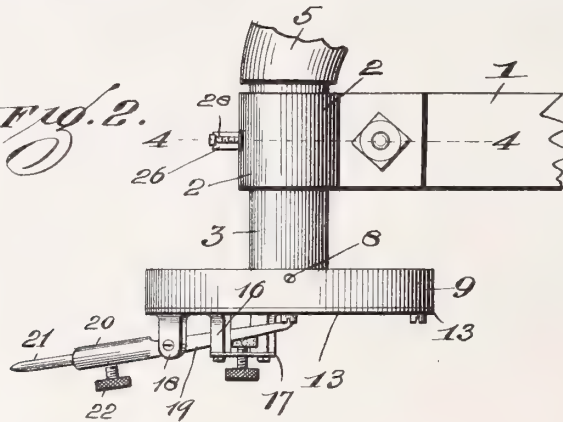


Fig. 3.

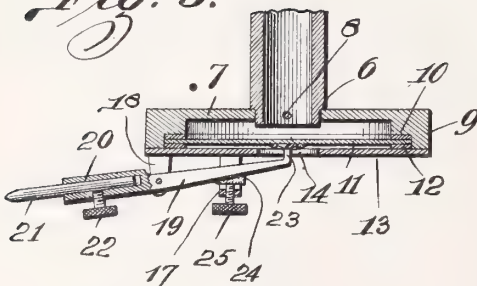
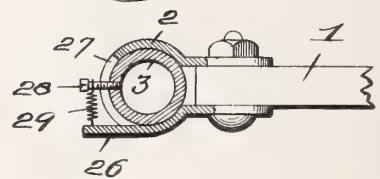


Fig. 4.



Attest
M. Smith
Maudie Griffin

Inventor:—
Adolph Betzold
By Higdon & Longan
attys.

UNITED STATES PATENT OFFICE.

ADOLPH BETZOLD, OF ST. LOUIS, MISSOURI, ASSIGNOR OF TWO-THIRDS TO THEODORE THORWEGEN AND THEODORE FLACK, OF SAME PLACE.

SOUND-REPRODUCER FOR TALKING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 633,226, dated September 19, 1899.

Application filed May 18, 1898. Serial No. 681,040. (No model.)

To all whom it may concern:

Be it known that I, ADOLPH BETZOLD, of the city of St. Louis, State of Missouri, have invented certain new and useful Improvements in

5 Sound-Reproducers for Talking-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention relates to sound-reproducers for talking-machines; and it consists of the novel construction, combination, and arrangement of parts hereinafter shown, described, and claimed.

Figure 1 is a front elevation of my improved

15 sound-reproducer, the same being shown in position relative to one of the record-disks. Fig. 2 is a plan view of the reproducer seen in Fig. 1. Fig. 3 is a horizontal sectional view taken approximately on the line 3 3 of Fig. 1. Fig. 20 4 is a detail sectional view taken approximately on the line 4 4 of Fig. 2 and showing a modified form of the connection between the reproducer and the arm that carries the same.

25 My improved sound-reproducer is especially applicable for machines using flat record-disks, though the same principle, with slight variation in construction, may be used in reproducers for machines using record-cylinders.

30

In the construction herein shown the wooden arm 1 is provided on its outer end with a collar 2, in which is horizontally arranged a short tube 3, with the outer end of

35 which connects the horn or trumpet 5, that discharges the sounds reproduced by my improved device. The opposite end of the tube 3 from the end on which the trumpet connects is reduced in diameter to form a shoulder 6, and upon this reduced end is removably located a disk 7 of any suitable material, there being a pin or screw 8 passed vertically through said disk and through the reduced end of the tube 3. Formed integral with the

40 front face and edge of this disk 7 is a flange 9, in the inner edge of which is formed a continuous recess 10. Within this recess is located a diaphragm 11, of mica, glass, parchment, or analogous material, the edges thereof

45 being held between two packing-rings 12, and said packing-rings and said diaphragm are

held in the recess 10 by means of a disk 13, equal in circumference to that of the disk 7, said disk 13 being held upon the face of the flange 9 by means of screws 15 or in any suitable manner. Formed through the center of this disk 13 is an aperture 14, and located upon the face of said disk, at a slight distance from said aperture 14 on opposite sides thereof, are the integral lugs 16, there being a plate 60 17 located upon the outer ends of said lugs and held thereto in any suitable manner.

Formed integral with the outer edge of the disk 13 at a point in alinement with the center of said disk and between the lugs 16 is a 65 second pair of lugs 18, between the outer ends of which is fulcrumed an arm 19, the outer end of which is formed into a tube 20, which carries the reproducing-needle 21, said needle being held in said tube 20 by means of the set- 70 screw 22. The inner end of this arm 19 is extended inwardly through the aperture 14, said inwardly-turned end 23 being located upon the outer face of the diaphragm 11 and held thereto by means of wax or in any suitable 75 manner. At the point where the arm 19 passes beneath the plate 17 it is provided with a section of rubber 24 or analogous material, and a set-screw 25 passes through the center of the plate 17 and engages against this section 80 of rubber, this set-screw providing means for accurately adjusting and regulating the vibrations of the needle, arm, and reproducing-diaphragm.

Extending outwardly from the under side 85 of the collar 2 is an arm 26, there being a slot 27 formed in the collar immediately above said arm, and extending through this slot 27 into the tube 3 is a pin or screw 28, and a retractile coil-spring 29 connects said pin or screw 90 with the arm 26. The tendency of this coil-spring is to hold the point of the needle 21 upon the surface of the record-disk. In some instances the disk 7 may be formed integral with the outer end of the tube 3; but much 95 better results are obtained where said disk and tube are constructed separately and held together by the pin or screw 8.

In the operation of my improved sound-reproducer the needle is located in the tubular 100 end of the arm 19, and after the disk has been set in motion the point of said needle is placed

upon the surface of said disk, and as said needle travels in the indentations in said disk the sound corresponding to said indentations will be reproduced in the usual manner by the vibrations of the diaphragm 11, and the sound thus reproduced will travel through the tube 3 and be discharged through the trumpet 5, which acts as an amplifier. The cushion 24, of rubber, being loosened or depressed upon the arm 19 by means of the set-screw 25 will readily and accurately adjust and regulate the vibrations of said arm, and consequently the diaphragm 11, and the reproduced sound will therefore be regulated. By thus locating the rubber cushion in position a soft even tone may be produced instead of a hard metallic tone, as heretofore, and all the grating and scratching noises unpleasant to the ear will be eliminated from the reproduced sounds. By properly manipulating the thumb-screw tones ranging from loud to very soft may be produced, even though the record upon the disk be the reverse of the tone desired.

It is preferable that the sound-box comprising the disk 7 and flange 9 be of metal, and it is also desirable that the packing-rings

12 be of some soft material, such as blotting-paper or felt.

A sound-reproducer of my improved construction is simple, will not readily get out of order, can be accurately adjusted, and is applicable for all styles of talking-machines.

I claim—

The improved sound-reproducer for talking-machines, comprising the sound-box, the diaphragm, the disk 13 having the central aperture 14, two lugs or projections 16 extending at right angles from the outer face of said disk, the plate 17 fixed upon the outer ends of said lugs or projections, the needle-carrying arm, the inner end of which is secured to the diaphragm, the rubber cushion 24 seated upon said needle-carrying arm, and the set-screw 25 threaded through said plate 17 and bearing upon said rubber cushion 24, substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

ADOLPH BETZOLD.

Witnesses:

EDWARD E. LONGAN,
M. P. SMITH.

No. 634,025.

Patented Oct. 3, 1899.

A. B. ROBINSON.

MULTIPLE MANDREL ATTACHMENT FOR PHONOGRAPHS.

(Application filed Feb. 21, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

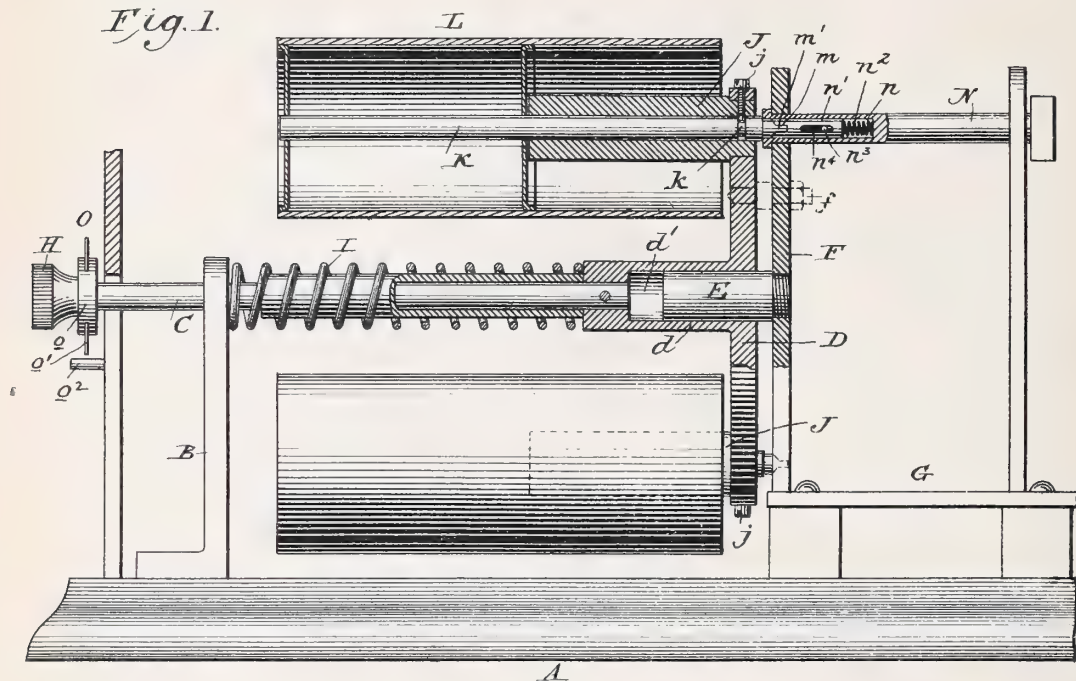
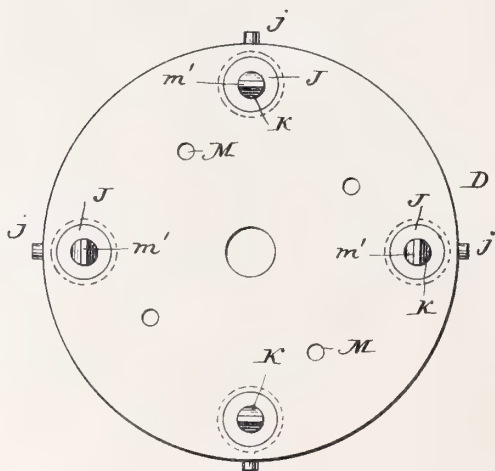


Fig. 2.



Witnesses;

Henry P. Hollingsworth
 A. M. Perkins.

Inventor,

Arthur B Robinson,

By *Baldwin Dandson & Noylt*
Attorneys.

No. 634,025.

A. B. ROBINSON.

Patented Oct. 3, 1899.

MULTIPLE MANDREL ATTACHMENT FOR PHONOGRAPHS.

(Application filed Feb. 21, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.

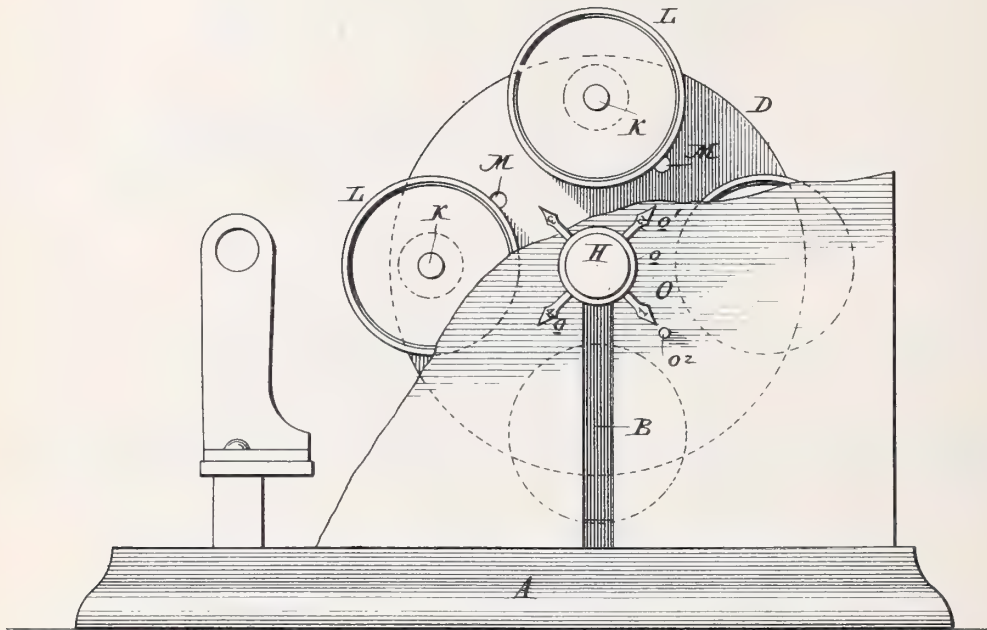


Fig. 4.

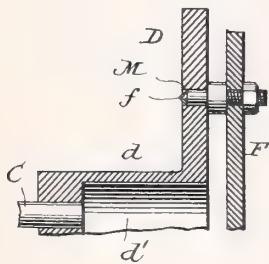


Fig. 5.

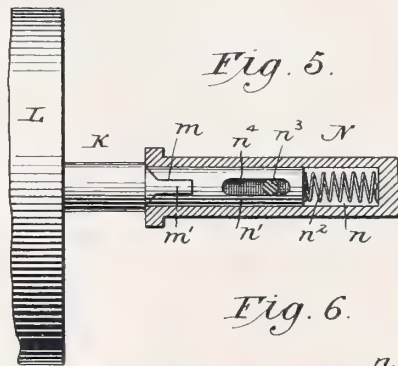


Fig. 7.



Fig. 6.

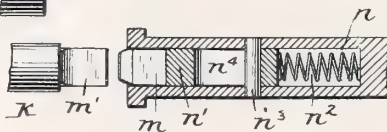
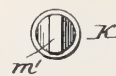


Fig. 8.



Witnesses,

Sony P. Hollingsworth
A. M. Perkins.

Inventor,

Arthur B. Robinson.

by

Reuben Davidson Wright.

His Attorney's.

UNITED STATES PATENT OFFICE.

ARTHUR B. ROBINSON, OF DICKINSON, NORTH DAKOTA.

MULTIPLE MANDREL ATTACHMENT FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 634,025, dated October 3, 1899.

Application filed February 21, 1899. Serial No. 706,432. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR B. ROBINSON, a citizen of the United States, residing at Dickinson, in the county of Stark and State of North Dakota, have invented certain new and useful Improvements in Multiple Mandrel Attachments for Phonographs, &c., of which the following is a specification.

The object of my invention is to provide improved means for supporting a plurality of record-cylinders for use in phonographs, graphophones, and the like in such manner that any one of them may by very simple means be brought into operative relation with the mechanism for rotating it relatively to the recorder or reproducer.

In carrying out my invention I provide a reel comprising a shaft, a disk, and lateral supports for the mandrels, and to the shaft I apply a handle for turning it and an indicator for designating the position of the several mandrels. A spring moves the reel in one direction, while by means of the handle the reel may be moved against the force of the spring in the opposite direction. Devices are employed for locking the reel in the position in which it is adjusted, and each mandrel-shaft is provided with clutch mechanism by means of which it may be connected with a power-shaft, which drives the shaft of the mandrel carrying the cylinder which is adjusted to position adjacent to the recorder or reproducer.

The details of construction will be hereinafter specified.

In the accompanying drawings, Figure 1 is a view, partly in side elevation and partly in section, of an apparatus adapted to support and operate a plurality of record-cylinders. Fig. 2 is an end elevation of the reel. Fig. 3 is an end elevation of the apparatus with some of the parts broken away or removed. Fig. 4 is a detail view in section of the devices for stopping and holding a reel while one of the record-cylinders is being rotated. Figs. 5 and 6 are detail views of the clutch mechanism for connecting the power-shaft with the mandrel-shaft of the cylinder which has been adjusted to position adjacent to the recorder or reproducer. Fig. 7 is an end view of one member of the clutch, and Fig. 8 is an end view of the other member thereof.

The bed-plate A is provided with a standard B, through which extends a shaft C, which may be called the "reel-shaft" or "magazine-shaft," inasmuch as the reel carries a plurality of cylinders. One end of the shaft is supported in bearings in the standard B, while the opposite end is secured to a hub *d* on a disk D. The hub *d* is provided with a recess *d*, into which extends a stud E, projecting from an upright frame-piece F, which projects upwardly from an elevated frame G, mounted on the bed-plate A. The shaft C is provided with a handle H, by means of which it may be turned in either direction. The shaft, it will be observed, is thus supported at opposite ends and held in proper alinement, and when the shaft is turned the disk D turns with it. Between the standard B and the hub *d* is interposed a coiled spring I, which is placed under proper tension to normally push the shaft C to the right, as viewed in the drawings. When the shaft is pulled to the left by means of the handle H, it puts the spring under compression, and when the handle is released the spring returns the shaft to its original position. The disk D carries a series of laterally-projecting sleeves J, which are parallel with each other and project inwardly and are parallel with the shaft C. Mandrel-shafts K extend through the sleeves J, and these shafts support the mandrels L for the record-cylinders. The sleeves J are held in place by means of set-screws *j*, extending inwardly from the periphery of the disk D, and these set-screws also extend into annular grooves *k* on the shafts K. Thus both the sleeves J and mandrel-shafts K are held firmly in position on the disk D, and they may be readily removed therefrom when desired by loosening the set-screws *j*. By properly manipulating the set-screws either the shafts K, together with the mandrels L, may be removed or both the shafts K and sleeves J may be removed together from the disk.

The disk D is provided with a series of apertures M, there being one for each mandrel, and the frame F is provided with a stop-pin *f*, adapted to enter the apertures. When the stop-pin *f* is engaged with one of the apertures in the manner illustrated in Figs. 1 and 4, the reel cannot rotate; but if the shaft C is drawn to the left, as viewed in Fig. 1, against

the force of the spring I the disk will be withdrawn from the stop-pin and the reel may be turned in either direction to the desired extent.

5 In order to drive the mandrels, I provide a power-shaft N, which may be driven in any suitable way. This shaft at its inner or left-hand end is recessed at n , and within this recess is a sliding clutch-block n' . Between the
10 inner end of the clutch block and the end of the recess is interposed a coiled spring n^2 , which normally forces the block outward toward the shaft K. The inward-and-outward movement of the clutch-block is limited by a
15 pin n^3 , which operates in a slot n^4 in the clutch-block. At its extreme left-hand end, as viewed in Fig. 1, the clutch-block is provided with a recess m , which fits the correspondingly-shaped end m' of the shaft K. When the two
20 are interlocked, there is a practically rigid connection between the shaft K and the power-shaft, so that when the power-shaft is driven the mandrel-shaft and the parts carried thereby will be correspondingly driven.
25 The front end of the magazine-shaft C is provided with an indicator O, which consists of a hub o , provided with a series of radial pointers o' , there being one for each mandrel. In connection with the pointers I employ a pin
30 o^2 , which is fixed to the casing and is stationary. The position of the mandrels within the casing may thus be readily indicated and any particular one of the mandrels may thus be brought into place by suitably manipulating
35 the handle H until the desired pointer comes opposite the pin o^2 . By the arrangement shown not only can the record-cylinders be successively brought into position for operation, but they can be readily removed and re-
40 placed without disarranging other parts of the mechanism. The mandrel-shafts K and the sleeves J are attached at only one end to

the disk D. By omitting part of the front casing, as indicated in Fig. 3, the cylinders
45 might be slid onto and off the mandrels without removing the shafts K or the sleeves J.

I claim as my invention—

1. The combination of a supporting-frame, a reel comprising a shaft, a disk, and later-
50 ally-projecting sleeves, a series of mandrels each having a mandrel-shaft fitting a sleeve, devices for detachably securing the mandrel-shafts to the sleeves, a power-shaft and de-
55 vices for clutching the power-shaft to a mandrel-shaft.

2. The combination of a supporting-frame, a magazine-shaft mounted in bearings there-
in, a disk secured to the shaft, a spring for moving the shaft in one direction, a series of
60 sleeves detachably secured to the disk and projecting laterally therefrom, a series of mandrels each having a shaft detachably con-
65 nected with a sleeve, means for turning the magazine-shaft, a power-shaft, and devices for clutching the mandrel-shaft to the power-shaft.

3. The combination of a supporting-frame, a magazine-shaft mounted in bearings there-
in, a disk having a hub attached to the maga-
70 zine-shaft, a spring surrounding the shaft, a handle on the shaft for moving it longitudinally against the force of the spring and for
turning it, an indicator on the shaft adjacent to the handle, a series of sleeves detachably
75 secured to the disk and projecting laterally therefrom, a series of mandrels each having a shaft, detachably connected with a sleeve, a power-shaft and devices for clutching a
mandrel-shaft with the power-shaft.

ARTHUR B. ROBINSON.

Witnesses:

JOE MESSERSMITH,
L. A. SIMPSON.

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15
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25
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No. 634,326.

Patented Oct. 3, 1899.

W. W. CRIDGE.

DIAPHRAGM PLATE FOR PHONOGRAPHS, &c.

(Application filed Mar. 11, 1898.)

(No Model.)

Fig. 1.

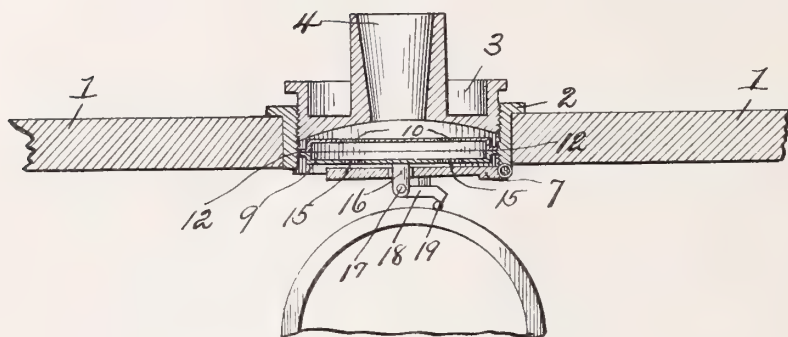


Fig. 2.

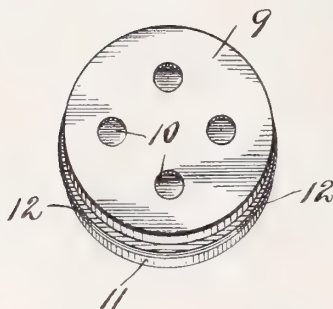
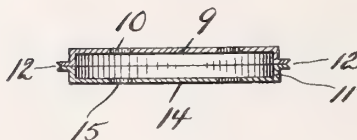


Fig. 3.



Witnesses
Albert Popkins.
E. H. Rufford.

Inventor
W. W. Cridge
By *H. C. Everett & Co.*
Attorneys

UNITED STATES PATENT OFFICE.

WALTER W. CRIDGE, OF PITTSBURG, PENNSYLVANIA.

DIAPHRAGM-PLATE FOR PHONOGRAPHS, &c.

SPECIFICATION forming part of Letters Patent No. 634,326, dated October 3, 1899.

Application filed March 11, 1898. Serial No. 673,490. (No model.)

To all whom it may concern:

Be it known that I, WALTER W. CRIDGE, a citizen of the United States of America, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Diaphragm-Plates, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to certain new and useful improvements in diaphragm-plates, such as are used in connection with phonographs and like instruments; and it has for its object to construct a diaphragm which
15 will produce a clearer sound from an instrument of this type.

In the drawings accompanying this specification, Figure 1 is a vertical sectional view of the recorder and reproducer equipped with
20 my improved diaphragm. Fig. 2 is a perspective view of my improved diaphragm. Fig. 3 is a vertical sectional view of the same.

Although my invention relates specifically to the diaphragm-plates for such instruments
25 as phonographs, I have shown in connection with the drawings a portion of a recorder and reproducer which is secured in the plate or receptacle 1 by means of the annular frame 2, screw-threaded on its inner periphery to
30 receive the frame 3 of the tube 4.

The diaphragm is composed of two circular

pan-shaped plates 9 and 14, each of which has its edge bent at right angles, these edges being adapted to abut together and form an annular flange 12 upon the rim 11, which en- 35 gages in the screw-threads of the annular frame 2 for holding the diaphragm in position. The upper plate 9 of the diaphragm 9 is provided with apertures 10, and the underneath plate 14 is preferably provided with like ap- 40 ertures 15.

The underneath plate 14 of the diaphragm may have attached thereto in any suitable manner a post 16, extending downwardly through the hinged plate 7, and is connected 45 by a pin 17 to a lever 18, which carries the recording and reproducing point 19.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is— 50

A diaphragm for phonographs and the like consisting of two circular pan-shaped plates having their edges bent at right angles and abutting to form an annular flange midway of the rim for securing the diaphragm in po- 55 sition, substantially as described.

In testimony whereof I affix my signature in the presence of two witnesses.

WALTER W. CRIDGE.

Witnesses:

JOHN NOLAND,
H. H. PATTERSON.

No. 634,944.

Patented Oct. 17, 1899.

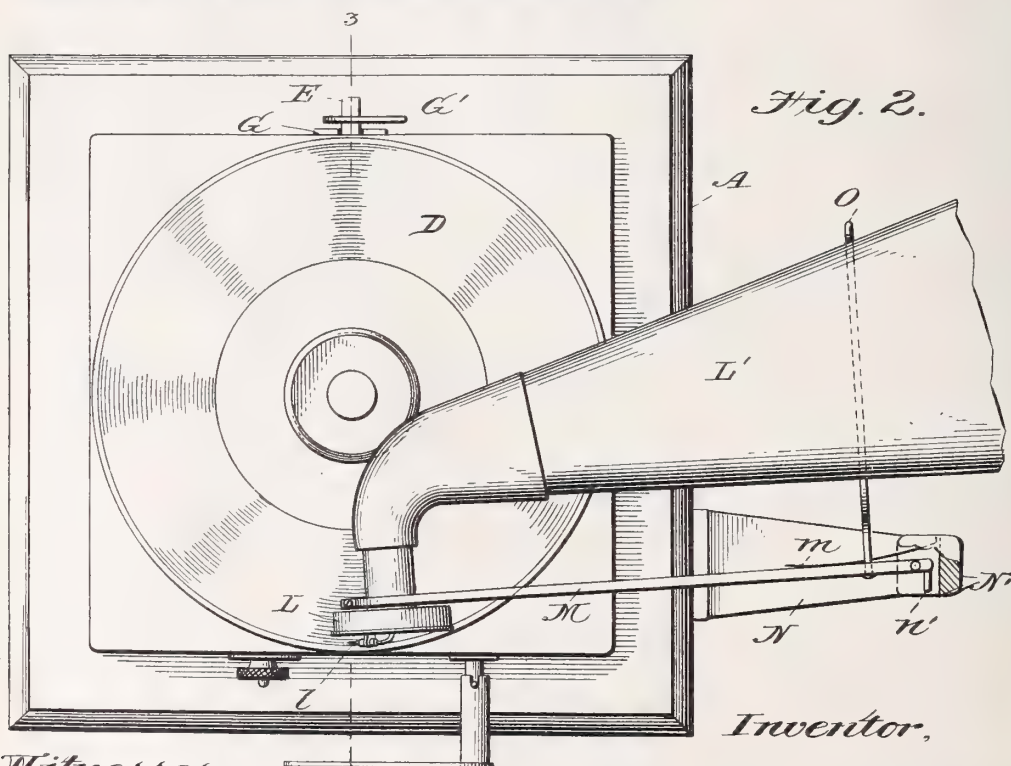
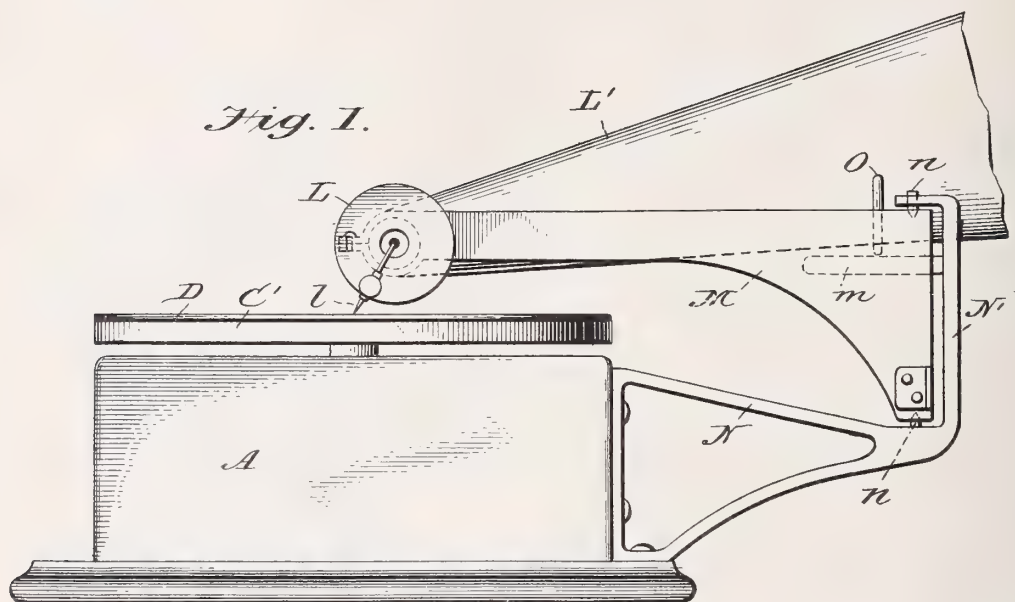
E. R. JOHNSON.

SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Jan. 3, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses.
J. F. Cross
J. Henderson

Inventor,
Eldridge R. Johnson.
by *John Peltz*,
his Attorney.

No. 634,944.

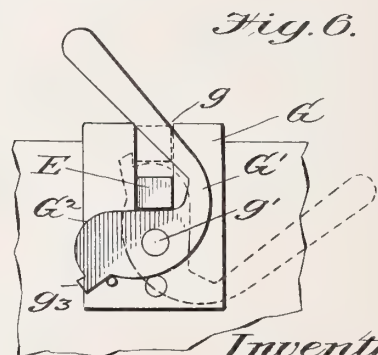
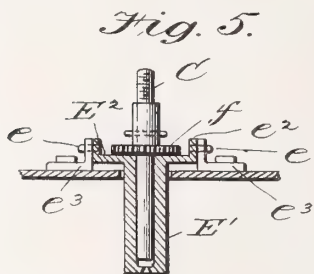
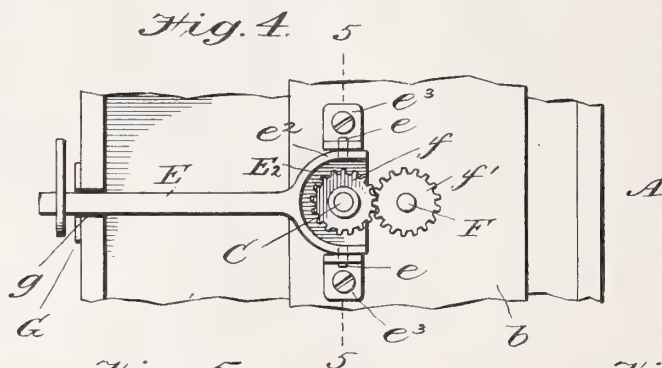
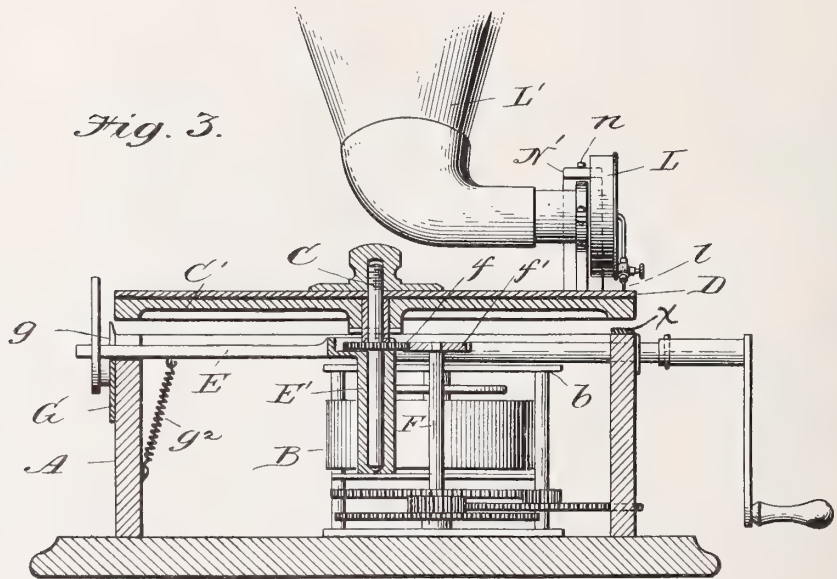
Patented Oct. 17, 1899.

E. R. JOHNSON.
SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Jan. 3, 1899.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses.
J. T. Cross
J. Henderson.

Inventor.
Eldridge R. Johnson,
by I. M. Peck,
his Attorney.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 634,944, dated October 17, 1899.

Application filed January 3, 1899. Serial No. 701,083. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in Sound Recording and Reproducing Machines; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to certain improvements in sound recording and reproducing machines, and particularly to machines wherein a flat record-disk is employed.

The object of my said invention is to provide an improved means for supporting the record-disk so as to render it capable of a yielding movement in one direction in order that it may be kept normally in contact with the stylus of a reproducer which is supported rigidly against vertical movement, and at the same time the disk is adapted to yield to accommodate any unevenness that might occur in the said record-disk; also, in providing means for tilting the said record-disk, so as to remove it from contact with the stylus of the reproducer and admit of the reproducing mechanism being removed in a lateral direction from the path of the record when it is desired to remove the said record and substitute a new one; also, in providing means for holding and locking the record in its tilted position.

A further object of my invention is to provide an improved supporting means for the reproducer whereby it is held rigid against vertical movement, but capable of a lateral or swinging movement, so that the stylus can follow and be propelled by the grooves of the record when it is in contact with the same; also, to provide means for positively swinging the reproducer to one side and out of the path of the record as soon as the said record is removed from contact with the stylus.

Another object of my invention is to simplify and cheapen the construction of machines of this character and at the same time increase the efficiency of the working parts.

These and other objects and features will be readily understood from the construction hereinafter described.

In sound recording and reproducing machines of the well-known types numerous objectionable features exist in construction which my present invention is designed to remedy. Among others, particularly in machines where the reproducer is loosely mounted and free to be raised vertically from the face of the record, the reproducer is liable to be accidentally dropped when in a raised position, causing the stylus to strike against the record or its supporting-table and to break or badly damage both the stylus-point and the diaphragm of the reproducing mechanism. My invention of a reproducer mounted rigidly against vertical movement and having means for positively moving the reproducer out of the path of the record, in combination with means for tilting that side of the record which bears against the stylus, obviates such difficulties and renders such liability to damage the parts impossible even when the machine is operated by the most inexperienced hands.

My invention consists in the construction such as herein described and particularly pointed out in the claims made hereto.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference are used to indicate similar parts, Figure 1 is a side elevation of a gramophone embodying my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a sectional elevation taken on the line 3 3 of Fig. 2, the reproducer being shown in full lines. Fig. 4 is a detail plan view of the pivoted rocking arm in which the record-spindle is mounted. Fig. 5 is a detail section through the same, taken about on the line 5 5 of Fig. 4. Fig. 6 is a side elevation of the cam mechanism used for tilting the record and holding the same in its tilting position, the tilted position being shown in dotted lines.

In carrying out my invention I provide an outer box or casing A, mounted on a suitable supporting-base and having located therein a spring-motor B, which may be of any of the well-known constructions now employed in machines of this character.

Located centrally in the casing A is the driving-spindle C, which projects above the top of the outer casing and carries the turntable C', which supports the record-disk D.

The spindle C is loosely mounted in a sleeve or socket E', formed on the rocker-arm E, which is pivoted at *e* to the frame *b* of the motor, as will be hereinafter described. A pinion *f* is rigidly secured on the spindle C, which meshes with a pinion *f'*, secured on the shaft F, which is suitably geared to the propelling mechanism of the motor and by means of which the record-spindle C is revolved.

The rocker-arm E has formed on its inner end a yoke E², having a flange e², carrying the trunnions *e*, located diametrically opposite each other and adapted to be supported in the brackets c³, which are secured to the upper frame *b* of the motor. Formed on the lower side of the yoke E² is the depending sleeve E', which supports the driving-spindle C, as before described. The outer end of the arm E extends through an opening provided in the casing A and rests in the bottom of a slot *g*, provided in a plate G, secured on the outside of the casing A. A spring *g*², fastened at one end to the arm E and at its other end to the inner side of the casing A, holds the arm E and the shaft C in normal position. The turn-table C' and record D are thus normally held in a substantially horizontal plane. On the plate G is pivoted at *g'* a cam-lever G', having formed thereon a cam-face G² and a projecting lug *g*³.

When it is desired to tilt the turn-table and its record-disk, the lever G is thrown back to the position illustrated in dotted lines in Fig. 6 of the drawings and its cam-face G² raises the arm E, its lug *g*³, coming in contact with the arm E, serving as a stop to limit the downward movement of the said lever. This movement tilts the side of the record-disk diametrically opposite this end of the rocker-arm E and moves said record out of contact with the stylus of the reproducing mechanism, and at the same moment that the record moves away from contact with the stylus the supporting-arm of the reproducer swings outwardly by a positive movement, as will presently be described, until it is entirely out of the path of the record-disk, and the said record can then be readily removed.

The reproducing mechanism and its support are clearly illustrated in Figs. 1 and 2 of the drawings, and referring thereto L represents the sound-box, which carries the diaphragm and which may be of the usual construction. The stylus *l* is suitably secured in the stylus-bar, which forms a part of the sound-box. To the tubular end of the sound-box is fastened, by means of an elbow or otherwise, the trumpet L'.

M designates the supporting-arm for the reproducer, which is secured to its inner end in any suitable manner. The outer end of the arm M is pivotally mounted in the arm N' of a bracket N by means of the pivot-screws *n* or in any other suitable manner, the object being to mount this arm M so as to be capable of lateral movement, but rigid against ver-

tical movement. The bracket N may be of any desirable form and is secured to the outer casing A by means of screws or otherwise. An arm O extends from one side of the arm M for supporting the trumpet, as clearly illustrated in Fig. 2 of the drawings. On one side of the supporting-arm M is a spring *m*, secured at one end to the bracket-arm N' and having its other end bear against the side of said arm M, the purpose of which is to swing the said arm outwardly and away from the record-disk as soon as the same is moved out of contact with the stylus. A lug *n'* is provided on the other side of the arm M, which will strike against the bracket-arm N' and limit the movement of the said arm in its outward swing.

On the upper edge of the casing A is a piece of felt or other similar material, which is located on the side of the casing opposite the rocker-arm E and against which the turn-table bears when the same is tilted by the mechanism heretofore described.

In operation the record-disk is secured on its supporting-table while in a tilted position, and the reproducer and its carrying-arm are adjusted so that the stylus is directly over the beginning of the record-grooves, as shown in Fig. 2 of the drawings. The cam-lever G' is then thrown up to the position shown in full lines in Fig. 6 of the drawings, and the rocker-arm E is pulled down to the position shown in Fig. 3 of the drawings under the action of the spring *g*². This movement throws the turn-table C' and record-disk C back to normal position and causes the grooves of the said record to come in contact with the stylus of the reproducer, the spring *g*² tending to keep the rocker-arm down and the opposite side of the record-disk up against the stylus at all times, while at the same time the said record-disk is capable of a yielding movement, so as to accommodate any irregularities or unevenness that might occur in the record-disk, while the pivoted support of the reproducer admits the stylus to move laterally in following and being carried by the grooves. When the reproduction has been completed, the lever G is thrown down and the pivoted rocker-arm E thrown up, which tilts the record D and removes it from contact with the stylus of the reproducer, while at the same time the spring *m* throws the pivoted supporting-arm M outwardly and away from the path of the record-disk. The record-disk can then be easily and readily removed and a new record substituted.

Various slight changes might be made in my invention as described without departing from the spirit and scope thereof. Hence I do not desire to limit myself to the exact construction shown in the drawings and described herein.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a sound recording and reproducing ma-

chine, a reproducer rigidly supported against vertical movement, a revoluble driving-spindle, a record-disk secured on said driving-spindle, a pivoted rocking arm, in which the driving-spindle is journaled and means for holding the free end of the rocking arm so as to keep the record-disk in contact with the stylus of the reproducing mechanism, substantially as described.

2. In a sound recording and reproducing machine, the combination of a laterally-movable reproducer rigidly secured against movement toward or from the face of the record, a revoluble record-disk mounted so as to yield in one direction, means for keeping the grooves of the record-disk in yielding contact with the stylus of the reproducing mechanism and means for tilting the record-disk so as to free it from contact with the said stylus, substantially as described.

3. In a sound recording and reproducing machine, the combination of a laterally-movable reproducer rigidly secured against vertical movement, a revoluble pivoted record-disk adapted to yield in the direction of its point of contact with the reproducing-stylus, means for holding the grooves of the said record normally in contact with the stylus-point and means for positively tilting the record so as to remove it from contact with the stylus-point, substantially as described and for the purpose stated.

4. In a sound recording and reproducing machine, the combination of a reproducer mounted rigidly against vertical movement but capable of lateral movement, a revoluble driving-spindle, a record-disk secured on said driving-spindle, a rocking arm pivoted to the frame of the machine, and in which the driving-spindle is journaled, and a spring secured to the free end of said arm for normally holding it down and keeping the record-disk in contact with the stylus of the reproducing mechanism, substantially as described.

5. In a sound recording and reproducing machine, the combination of a laterally-movable reproducer secured against vertical movement a revoluble driving-spindle adapted to carry a record-disk, a rocker-arm pivoted at one end to the frame of the machine and in which the driving-spindle is journaled, a spring for holding the free end of the rocking arm normally down and keeping the record-disk in contact with stylus of the reproducer, and a cam-lever pivoted to the casing of the machine adapted to bear against the free end of the rocking arm for raising the same and tilting the record-disk, substantially as described.

6. The combination with a laterally-movable reproducer secured against vertical movement, of a rocker-arm, E, having a depending sleeve or socket, E', trunnions, e, by means of which said rocker-arm is pivotally mounted to the frame of the machine, a revoluble driving-spindle adapted to the

socket, E', a turn-table secured on said driving-spindle, a record-disk carried by the said turn-table, a spring, g², secured to the under side of the free end of the arm, E, and to the casing of the machine, and a cam-lever, G', adapted to engage the free end of the arm E for tilting the same, substantially as described and for the purpose stated.

7. In a sound recording and reproducing machine, the combination of a yielding record-holder, a reproducer rigidly mounted against vertical movement but capable of lateral movement to allow of the reproducing-stylus being automatically propelled by the record-grooves, and means for keeping the grooves of the record in contact with the stylus of the reproducing mechanism, substantially as described.

8. In a sound recording and reproducing machine, the combination with a revoluble yielding record-disk of a reproducer located above the same, a stylus carried by the said reproducer adapted to engage the grooves of the record-disk, a laterally-swinging arm for supporting the reproducing mechanism held rigid against vertical movement, and means for automatically moving said arm out of the path of the record as soon as the said record is removed from contact with the stylus of the reproducer, substantially as described.

9. The combination of a yielding revoluble record-disk, a reproducer located above the same, a stylus carried by the reproducer adapted to engage the grooves of the record-disk, a supporting-arm for the reproducing mechanism pivoted in a bracket carried by the frame of the machine, said arm being capable of a lateral movement but rigid against vertical movement, means for tilting the record so as to remove it from contact with the reproducer and means for positively swinging the reproducer and its supporting-arm out of the path of the record-disk as soon as the record is removed from contact with the stylus-point of the reproducing mechanism, substantially as described.

10. The combination of a yielding revoluble record-disk, a reproducer located above the same, an arm, M, for supporting the reproducing mechanism, a bracket, N, carried by the frame of the machine in which the arm M, is pivoted so as to be capable of moving laterally but rigid against vertical movement a spring, m, adapted to bear against the inner side of the arm, M, for swinging it out of the path of the record when the said record is moved from contact with the stylus of the reproducer and a lug, n, for limiting the outward swing of the arm, M, substantially as described.

In witness whereof I have hereunto set my hand this 30th day of December, A. D. 1898.

ELDRIDGE R. JOHNSON.

Witnesses:

BENJ. F. PERKINS,
HORACE PETTIT.

No. 635,120.

Patented Oct. 17, 1899.

G. BETTINI.
PHONOGRAPH.

(Application filed June 8, 1899.)

(No Model.)

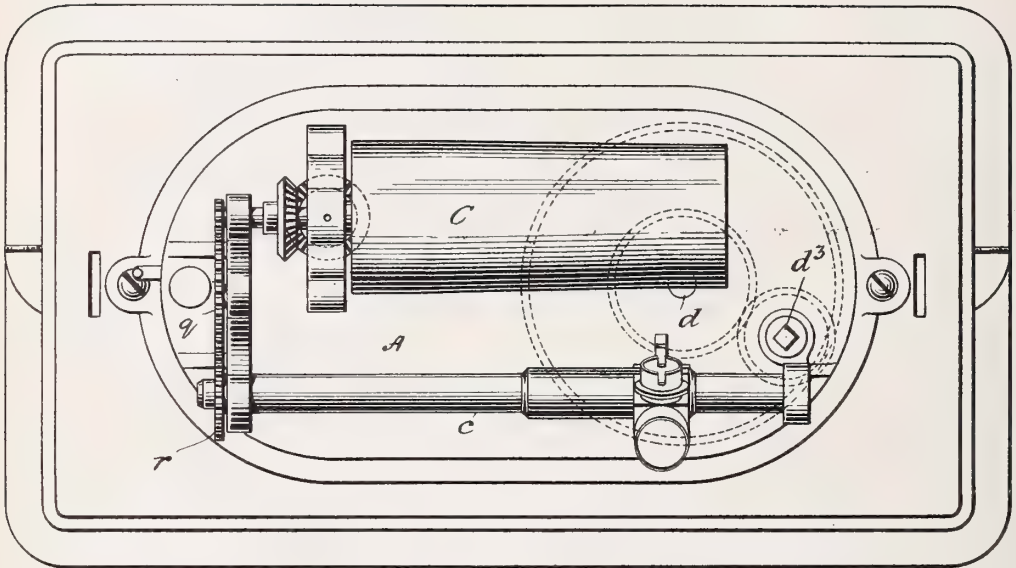


Fig. 1

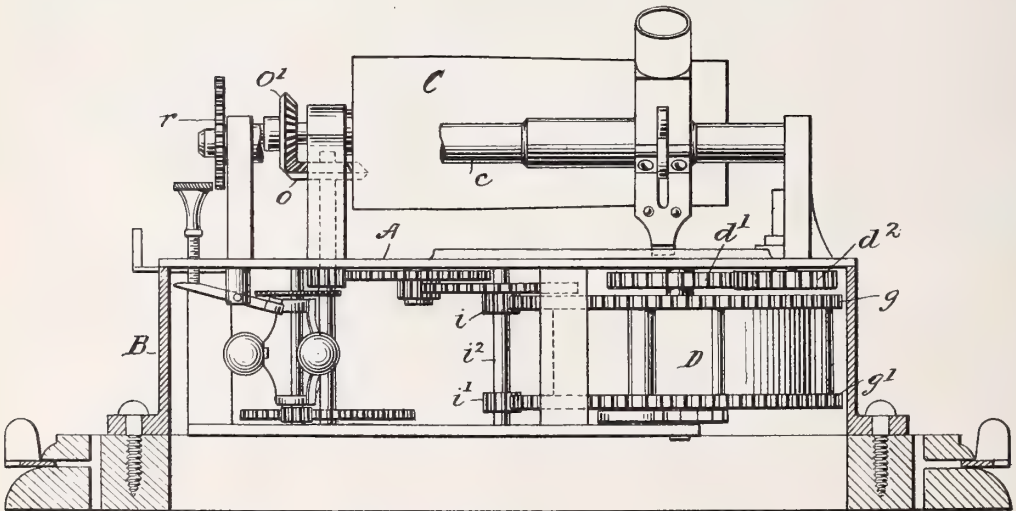


Fig. 2.

WITNESSES:

Frank S. Oden
Geo. S. Kennedy.

INVENTOR

Gianni Bettini

BY

M. A. Rosenbaum
ATTORNEY

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 635,120, dated October 17, 1899.

Application filed June 8, 1899. Serial No. 719,753. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, a subject of the King of Italy, residing at the city of New York, in the borough of Manhattan
5 and State of New York, have invented certain new and useful Improvements in Phonographs, of which the following is a full, clear, and exact description.

This invention relates to sound recording
10 and reproducing machines, the object being to improve the general construction of the machine in the direction of simplicity and compactness of structure; and to this end the invention consists in the details of construction
15 hereinafter described and claimed.

With reference to the accompanying drawings, Figure 1 is a plan of my improved machine; and Fig. 2 is a front elevation of the machine, the motor-casing being in section
20 and parts broken away.

One of the features of my invention, enabling me to place the motor (which is a spring-motor in this instance) immediately beneath the plate upon which the phonograph proper
25 is mounted without enlarging said plate for this purpose, is the construction of the motor-train and the arrangement of the key-shaft with respect thereto.

The plate A is of oblong shape, rounded at
30 each end, and fits upon the upper edge of a motor-casing B, of the same general shape. This top plate is no larger than is necessary to support the cylinder C, the shaft *c* upon which the recording and reproducing devices
35 are carried, and the bearings in which said cylinder and shaft are mounted. The drum D, upon which the mainspring of the motor is wound, is arranged horizontally beneath the plate A at one end of the casing and concentric
40 with the curved end of said casing, so that the largest possible size of drum may be used without wasting space. To wind this kind of drum, it has been customary to use a horizontal lever projecting from the side of
45 the motor-casing and fitted inside with a pawl that engages with a ratchet on the drum-shaft; but I wish to do away with this means for winding and substitute one which does not occupy so much space. A key-shaft and
50 key is the form of winding device I prefer; but with the large drum located concentrically

in the curved end of the casing it would be impossible to adjust the key to the axis *d* of the drum, because of its position immediately beneath the cylinder C. Hence I apply to
55 the drum-shaft a gear-wheel *d'* and mount in the top plate another gear-wheel *d''*, whose shaft *d'''* projects upward through the top plate at a point where a key can be readily adjusted to it. This reverses the direction of the op-
60 erator's hand in winding the motor; but it permits of the use of the largest-size drum in a casing or frame no larger than is necessary to support the parts of the phonograph. Obviously the same size of drum could be
65 used if it were set somewhat to one side and the casing enlarged to the same extent to accommodate it; but this is undesirable.

The drum itself is constructed upon a novel
70 plan. Its end flanges are both formed into gear-wheels *g g'*, which engage with separate pinions *i i'* on a common shaft *i''*, from which
75 shaft the gear-train leads to the cylinder C and shaft *c*. This arrangement of double gearing from the drum to the train insures a more positive transference of the power, since there will be no tendency of the shaft *i''* to bend or work unevenly.

Most of the wheels of the train are arranged
80 in horizontal planes immediately beneath the cover-plate A; but the last shaft of the train extends upward through the cover-plate and carries a beveled gear *o*, which engages with
85 another similar gear *o'* on the cylinder-shaft. From this shaft motion is transmitted through gears *q* and *r* to the shaft *c*, which carries the usual screw for moving the sound recording or reproducing stylus and diaphragm across
the face of the record-cylinder.

Having described my invention, I claim— 90

In a sound recording and reproducing machine, the combination of a plate having a circular end, a record-carrying cylinder arranged opposite said plate and covering the center of said circular end of the plate; a
95 motor-casing of substantially the same shape in plan as said plate and being covered by said plate; a spring-drum located in said casing and mounted concentrically with the circular end of the plate and casing, a gear-wheel
100 on the axle of said drum; another gear-wheel engaging therewith and mounted on a key-

shaft having its bearing in said cover-plate
and through which it projects; a gear-train
leading from the drum and a shaft extending
from the train through the cover-plate, and
5 beveled gearing connecting said shaft with
the shaft of the record-carrying cylinder, sub-
stantially as described.

In witness whereof I subscribe my signature
in presence of two witnesses.

GIANNI BETTINI.

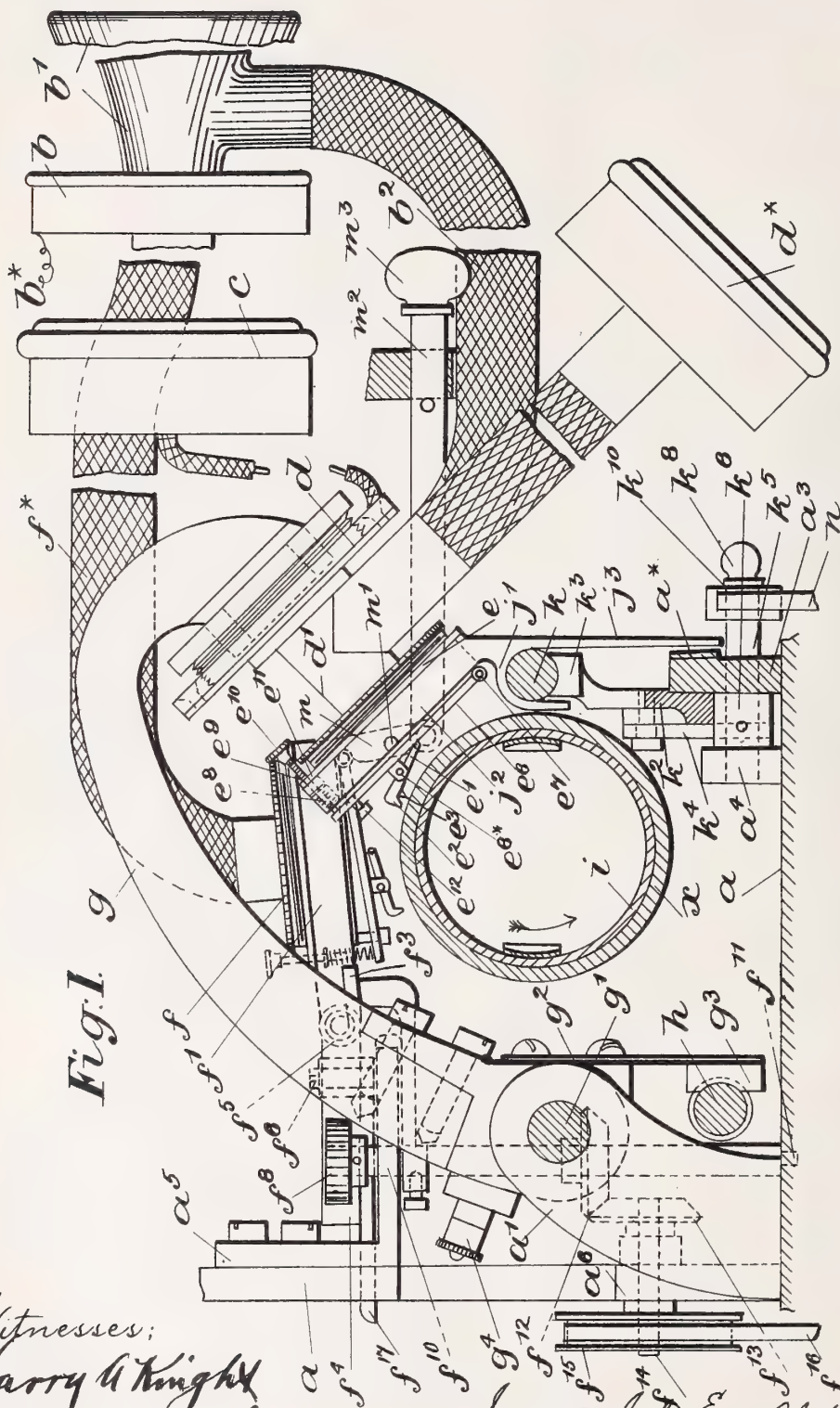
Witnesses:

WM. A. ROSENBAUM,
FRANK S. OBER.

(No Model.)

(Application filed Aug. 14, 1899.)

4 Sheets—Sheet 1.



Witnesses:
Harry A. Knight
Anna E. Lamb.

Inventor: Julius Ernst Oskar Kumberg
By: Knight & Bros. atty.

J. E. O. KUMBERG.
TELEPHONOGRAPH.

(Application filed Aug. 14, 1899.)

(No Model.)

4 Sheets—Sheet 2.

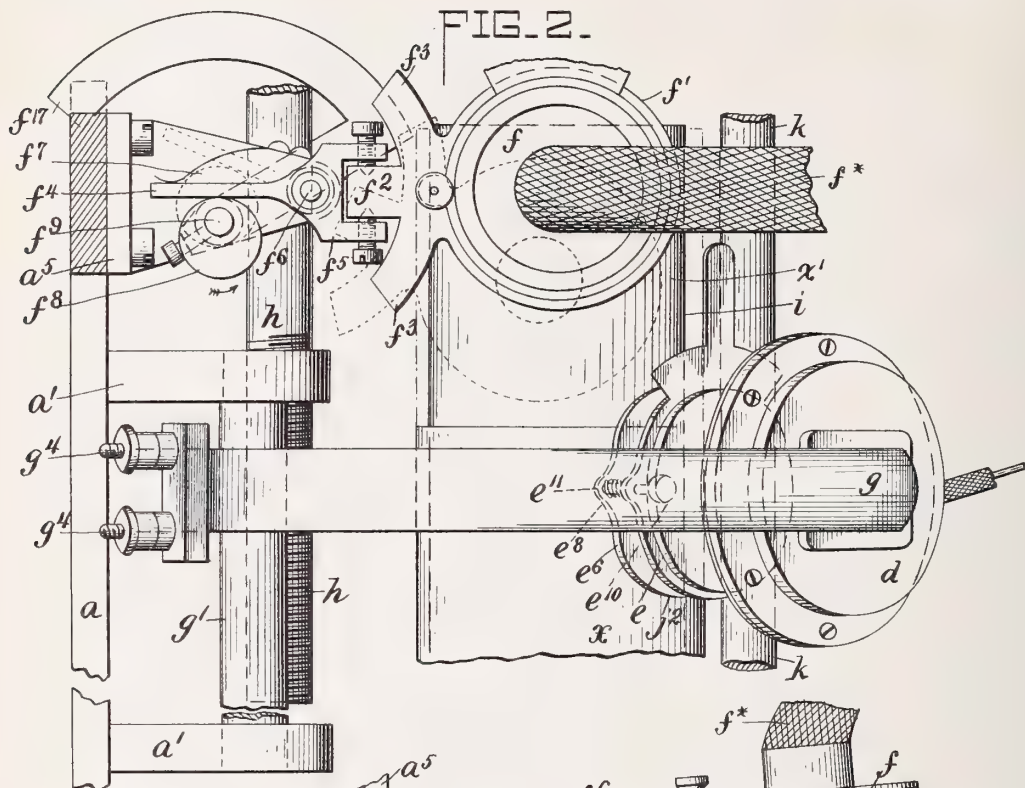


FIG. 3.

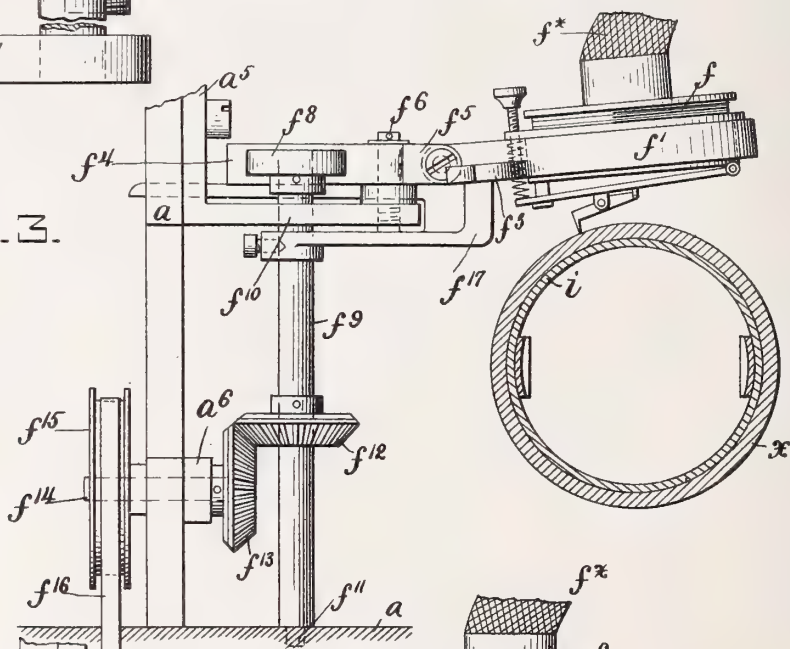
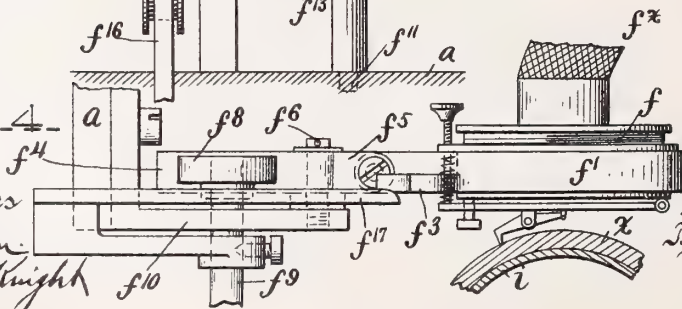


FIG. 4.

Witnesses
W. E. Allen
Harry A. Knight



Inventor
J. E. O. Kumberg
By *Knight & Allen*
Attorneys.

No. 636,209.

J. E. O. KUMBERG.
TELEPHONOGRAPH.

Patented Oct. 31, 1899.

(No Model.)

(Application filed Aug. 14, 1899.)

4 Sheets—Sheet 3

Fig. 5.

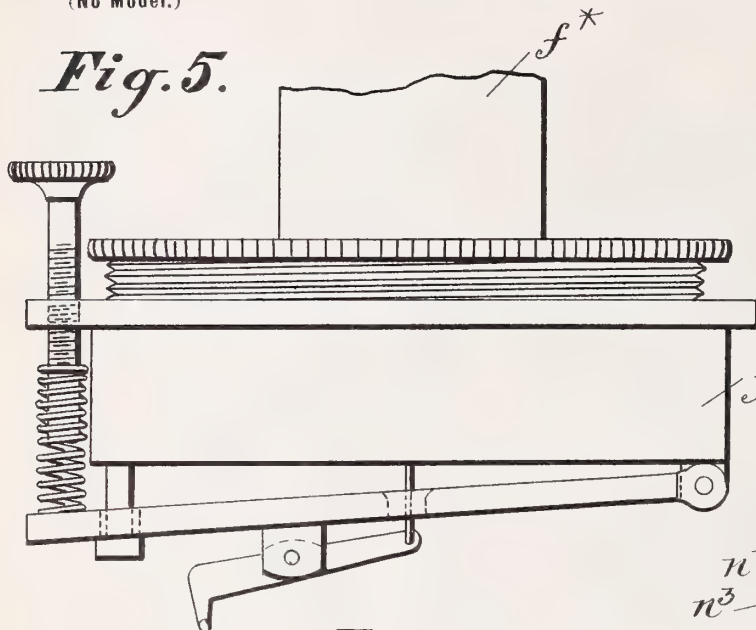


Fig. 6.

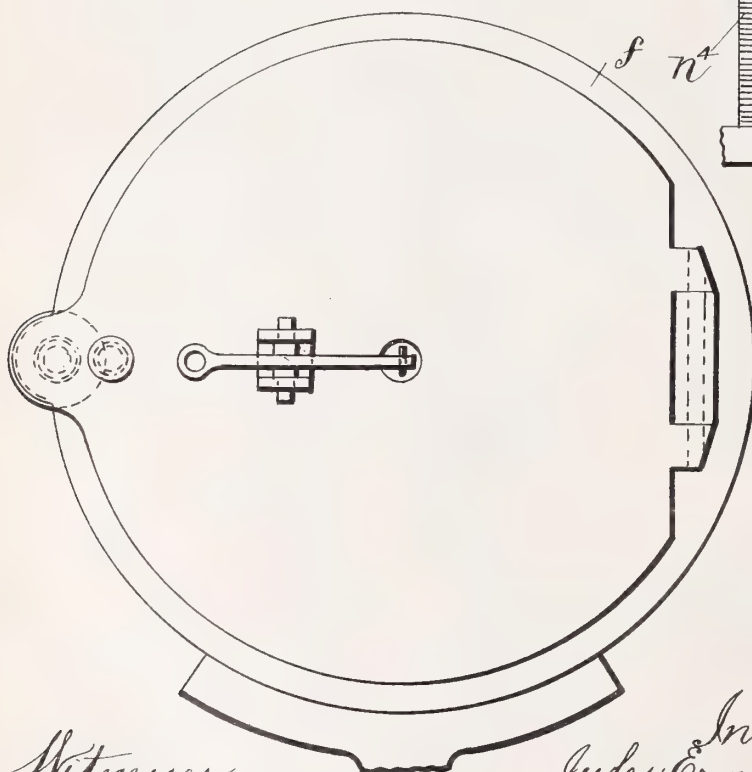
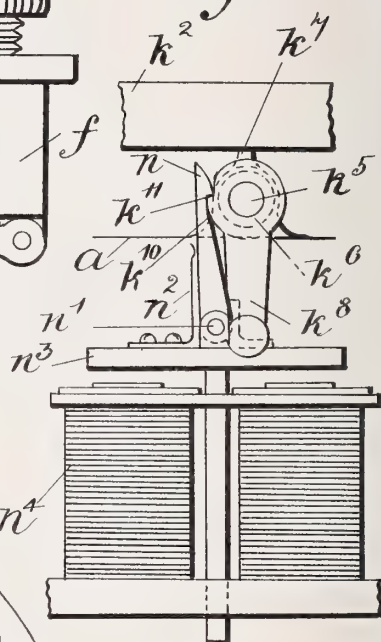


Fig. 9.



Witnesses
Harry M. Knight
Anna E. Lamb.

Inventor
Jules Ernest Othon Kumberg
By Knight Bros
Attys

J. E. O. KUMBERG.
TELEPHONOGRAPH.

(No Model.)

(Application filed Aug. 14, 1899.)

4 Sheets—Sheet 4.

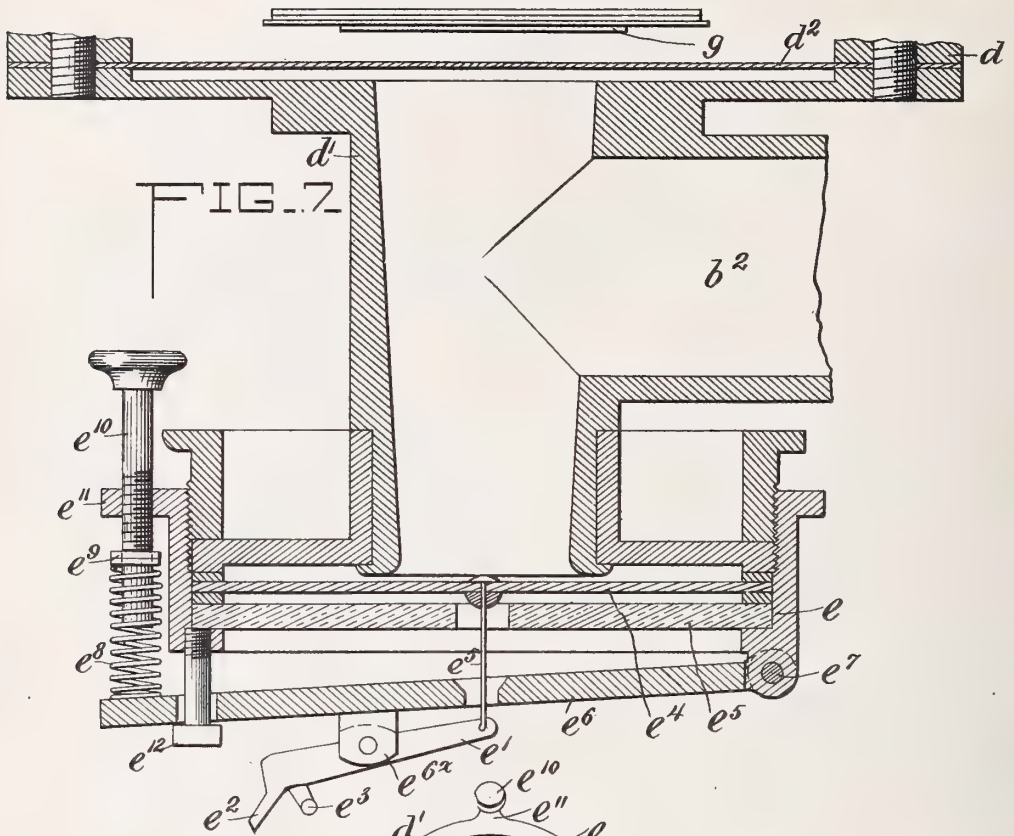
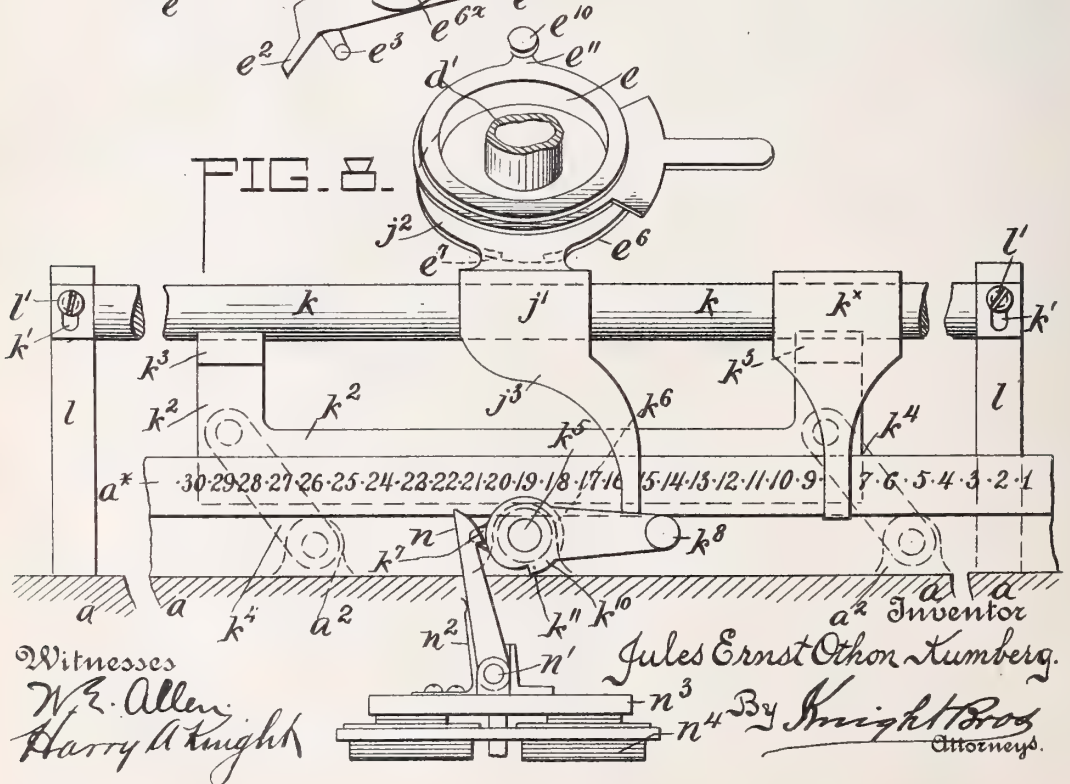


FIG. 8.



Witnesses
W. E. Allen
Harry A. Knight

Jules Ernst Othor Kumberg.
By Knight Bros
Attorneys.

UNITED STATES PATENT OFFICE.

JULES ERNEST OTHON KUMBERG, OF LONDON, ENGLAND.

TELEPHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 636,209, dated October 31, 1899.

Application filed August 14, 1899. Serial No. 727,238. (No model.)

To all whom it may concern:

Be it known that I, JULES ERNEST OTHON KUMBERG, French civil engineer, a citizen of the Republic of France, residing at 321 Milk-wood road, Herne Hill, London, in the county of Surrey, England, have invented certain new and useful Improvements in or Connected with Telephones, of which the following is a specification, reference being had to the accompanying drawings and to the letters marked thereon.

The object of the invention is to obtain an instrument which will record telephonic conversations or other sounds both at the transmitting and receiving stations and which will repeat to a person at a distant station short messages thus recorded; and the invention comprises the peculiar combination and arrangement of parts hereinafter described.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, representing an instrument constructed according to the present invention and showing the cutting-point of the recording instrument in engagement with the long phonogram blank or cylinder and the stylus of the reproducing instrument out of engagement with the short cylinder. Fig. 2 is a plan of part thereof. Fig. 3 is a detail view of part of Fig. 1. Fig. 4 represents part of Fig. 3, but showing the stylus of the reproducing-diaphragm in engagement with the short phonogram or cylinder. Fig. 5 is a side elevation of the reproducer separately. Fig. 6 is a plan thereof. Fig. 7 is a vertical section of the recording instrument separately. Fig. 8 is a front elevation of part of the instrument, illustrating more particularly the means for throwing the recording-stylus out of action and also the divided scale and pointer; and Fig. 9 represents part of Fig. 8, showing the operative parts in their opposite position.

In the several figures, in which like parts are indicated by similar letters of reference, Figs. 5 to 7 are drawn to an increased scale with respect to the other figures of the drawings.

a represents the base-plate and frame of the instrument.

b represents the transmitter, which may be of any well-known and highly-sensitive type.

c represents the ordinary receiver.

d represents the upper cell of the recording instrument, and e represents the lower cell thereof, which cells are coupled by a tube d' , and the cell e , which contains the recording-diaphragm proper, is carried in a holder mounted with capability of slightly turning upon the tube d' for the purpose hereinafter described, and f represents the cell of the message-reproducing diaphragm.

The recording instrument $d e$ is carried by a curved arm g , which is pivotally mounted with capability of laterally sliding upon a guide-bar g' , at its ends carried in brackets a' from the base-plate a , and the arm g near to its pivotal point is furnished with a spring-offset g^2 , at its lower end carrying a half-nut g^3 , which engages the ordinary feed-screw h , which is coupled with and driven by the usual electromotor (not shown) in the manner well known, by which means the recording instrument $d e$ is traversed longitudinally of the phonogram-blank x , placed upon the mandrel i , which is assumed to be mounted and driven in the manner customary in phonographic instruments. The arm g is hollow and has mounted therein the usual magnets, which, however, must be of a powerful character, and connections necessary to actuate the diaphragm d^2 in the upper cell d of the recording instrument, and said arm near to its pivotal point is provided with terminals g^4 , to which are coupled the line-wires, which, however, are not shown. The free end of the arm g is steadied by means of a saddle j' , which is carried by a collar j^2 , mounted on the cell e of the recording instrument, and this saddle j' rests upon a guide-bar k , which at its ends is flattened and provided with vertical slots k' , which receive studs l' , carried by posts l , fixed with the base-plate a , and the guide-bar k is loosely carried in curved seats or rests k^3 , provided at the upper part of a plate-like bar k^2 , which is carried by links k^4 , at their upper ends pivotally connected to the bar k^2 and at their lower ends pivotally carried by lugs a^2 from the base-plate a .

Transversely of the bar k^2 and at one end mounted at a^3 in that part of the frame a carrying the scale-bar a^* and at the other end mounted in a lug a^4 from the base-plate a is a short shaft k^5 , upon which is fixed beneath the bar k^2 a cam k^6 , formed with a nose or

point k^7 thereon, while the front end of the shaft k^5 is furnished with a crank-handle k^8 , by means of which the shaft k^5 may be rotated, so that by turning said shaft k^5 a quarter-revolution the cam k^6 will raise the bar k^2 , and consequently the recording instrument, and at the same time disengage the nut g^3 from the feed-screw h , thus throwing the recording instrument out of action, and the parts will thus be retained by the nose k^7 of the cam k^6 until the shaft k^5 is rotated in the opposite direction either by hand or by the electric device hereinafter described.

The mouthpiece b' of the transmitter b is provided with two channels, as it were, for the sound-waves—that is to say, the sound-waves produced by speaking into the mouth-piece b' travel directly through a tube, channel, or conduit b^2 to the recording-diaphragm e^4 of the cell e of the recording instrument at the transmitting-station and cause the cutting-tool e^2 of the lever e' , actuated by the diaphragm, to record the conversation upon the phonogram-blank x , carried by the mandrel i , and at the same time these sound-waves are electrically conveyed over the line-wire b^* to a similar instrument, which for the time being is the receiving instrument, at the distant station and pass by the terminals g^4 of the arm g through the electromagnets of the diaphragm-disk of the cell d of the distant recording instrument, which, as hereinafter described, is or may be coupled with the diaphragm-disk of the cell e , so that the sound-waves are similarly recorded at the distant station upon a phonogram-blank, such as x , while at the same time the conversation can be heard through the receiver c of the distant instrument, which is electrically connected with the recording instrument.

The lever e' of the recording instrument $d e$ is provided with two points, (see Figs. 1 and 7,) one, e^2 , a cutting instrument for recording on the phonogram-blank x and the other, e^3 , a blunt stylus for following the groove or incision formed by the cutting instrument, and the cell e of the recording instrument is mounted with capability of turning upon the tube d' , so that said cell may be slightly rotated to throw the cutting-tool out of action and the blunt stylus into action, or vice versa, in the well-known manner described in Letters Patent of Thomas A. Edison, No. 465,972, dated December 29, 1891, and thus the conversation may be reproduced by the instrument at either the transmitting or distant receiving station at will, and to enable said reproduction to be heard a listening-tube d^* is connected with the tube d' of the recording instrument $d e$.

The tubes b^2 and d^* may be run together and have a common connection with the recording instrument.

The recording instrument is of special construction—that is to say, it is provided with two compartments $d e$, the upper one d of which is an electrical telephone-receiver and

the lower one e of which is provided with a sensitive disk of glass e^4 or other suitable substance which receives the undulations produced by the natural sound-waves by way of the channel b^2 or sound-waves produced electrically through the electromagnets within the arm g , acting on the diaphragm d^2 , and communicates them to the lever e' , carrying the recording-stylus e^2 or other suitable tool underneath. Below the diaphragm e^4 , of glass, is provided an apertured cover or guard e^5 . The diaphragm-cell e (see Fig. 7) is also provided with an apertured floating weight e^6 , on which is pivotally mounted upon a stud e^{6*} the lever e' , which carries the recording and reproducing tools $e^2 e^3$, and this floating weight e^6 is mounted upon a loose hinge e^7 to admit of the reproducing-stylus e^3 readily following the channel or groove of the phonogram. Floating weights have been previously employed in a similar manner in phonograph apparatus, the object thereof being to enable the reproducing and cutting tools employed in said instruments to override any irregularities in the surface of the cylinder, the material of which the latter is made being liable to expansion and contraction; but it has been found by experiment that the revolving motion of the cylinder over which the stylus travels causes the floating weight to jump or rebound, and this obviously prevents the acting tool from properly fulfilling its function. In order to obviate this defect, the floating weight e^6 is, according to the present invention, made adjustable to said inequalities by means of a spring e^8 , which at one end bears upon the floating weight e^6 and at the other end acts against a disk e^9 , fixed with a regulating-screw e^{10} , screwing through a nut e^{11} , so that the force exerted by the spring upon the floating weight e^6 may be regulated at will, and in order to limit the maximum downward movement of the floating weight e^6 a stop e^{12} is provided, consisting of a headed stud fixed with the frame e and passing through an aperture in the weight e^6 . By the aid of the device lastly hereinbefore described the jumping action of the floating weight is modified or prevented, and the spring e^8 , while permitting the necessary up-and-down movement of the recording-stylus e^2 to adjustably follow the inequalities of the surface of the phonogram-blank, at the same time increases the impulses of the vibrations created by the sound-waves and causes the same to make a deeper cut or incision than heretofore, with the result that when reproduced the sounds are also increased, while the reproducing-stylus e^3 is similarly caused to more closely and adjustably follow the groove of the phonogram.

The recording instrument $d e$ is, as hereinbefore described, provided with a separate channel b^2 for receiving the non-electrical sound-waves which are to act upon the diaphragm e^4 of the recording instrument $d e$ —

that is to say, that part of the sounds which has to be recorded at the transmitting-station directly without the aid of the transmitter *b* and concurrently with its electrical conveyance by the line-wire *b*^{*} to the terminals *g*⁴ of the receiving apparatus at the distant station, where it passes through the arm *g* and recording instrument *d e* and is similarly recorded, as hereinbefore described.

The recording part of the instrument can, as hereinbefore explained, be put out of action when desired by simply turning the handle *k*⁸, thus raising the recording instrument *d e* and throwing the feed mechanism *g*⁸ *h* out of gear, when the telephonic transmitter *b b'* and receiver *c* may be used as an ordinary telephone.

The scale-bar carried by part of the frame *a* is provided with a divided and numbered scale *a*^{*}, as shown more particularly at Fig. 8, over which when the instrument is in operation travels an index or pointer *j*³, carried by the saddle *j'*, resting upon the slide-bar *k*, and also loosely mounted upon the slide-bar *k* is an indicator or marker *k*^{*}, and the object of this arrangement is to record by the stationary indicator *k*^{*} the position at which the conversation commenced and by the traveling hand or pointer *j*³ the position at which it terminated, and the operator is thus enabled to make a note in a register of these particulars, by which means he can at any future time at once select any particular message for reproduction by the instrument.

From the foregoing it will be understood that the conversation may be conveyed to one or more telephone-receivers at a distance concurrently with the recording of the conversation at the transmitting-station and that the conversation recorded upon the phonogram-cylinder *x*, as hereinbefore described, can be reproduced afterward as many times as desired by bringing into the track of the record the reproducing-stylus *e*⁸ of the reproducer *d e*.

For the reproduction of short messages a separate reproducer is preferably employed, and for that purpose the reproducer *f*, which is separately represented at Figs. 5 and 6 and is substantially the same as the lower part of the recording instrument hereinbefore described and the details of which are therefore unlettered, is supported in a holder *f'*, which is formed with an offset *f*², which is received between and pivotally mounted in the limbs of the fork *f*⁵ of a lever *f*⁴, which is mounted upon a vertical axis *f*⁶, carried by a bracket *a*⁵ from the frame *a*, and this lever is on one side acted upon by a spring *f*⁷, which moves it in one direction, while a cam *f*⁸, rotated at the times desired in the manner hereinafter described, moves it in the opposite direction, and thus the diaphragm *f* is traversed over the short phonogram-cylinder *x'*, hereinafter more particularly referred to. The phonogram upon the short cylinder *x'* is produced by placing it upon the mandrel *i* in position

beneath the instrument *d e*, bringing the stylus *e*² into action, switching on the motor, and speaking at the mouthpiece *b'*, and it is then shifted along the mandrel into the position indicated by the dotted lines *x'* in Fig. 2 in readiness for use. The sound-box *f* is adapted to be turned upon its pivotal point at *f*⁵ to raise it out of action, as indicated at Fig. 1, or to be lowered onto the phonogram *x'* when it is desired to reproduce a message, and in order to raise and hold it out of action when desired a lever or detent *m*, formed with a rounded nose or cam, Fig. 3, is employed, which is mounted upon an axis *m'*, said lever being actuated by a rod *m*², provided with a handle *m*³. The short message reproduced by the diaphragm *f* from the phonogram *x'* passes by the tube *f*^{*} to the telephone-transmitter *b*, which is intended to present a face rearward to the tube *b*^{*} as well as a face forward to the mouthpiece *b'*, whence it passes over the line-wire *b*^{*} to the receiving instrument at the distant station.

In order to give the required rotary motion to the cam *f*⁸, said cam is fixed upon the upper end of a shaft *f*⁹, Fig. 3, mounted with capability of revolving in a bearing *f*¹⁰ in the bracket *a*⁵, while at its lower end it is mounted in a bearing *f*¹¹ in the base-plate *a*, and this shaft has also fixed thereon a beveled wheel *f*¹², which gears with a corresponding wheel *f*¹³, fixed upon one end of a short shaft *f*¹⁴, mounted in a boss or bearing *a*⁶, formed on the frame *a*, while at its other end it has fixed thereon a band wheel or pulley *f*¹⁵, which by a band *f*¹⁶ is coupled with the pulley upon the shaft of the electromotor which gives motion to the mandrel *i* and feed mechanism and which is not shown, inasmuch as it is well known to persons acquainted with phonographic instruments. The sound-box *f* thus receives a traverse to and fro over the short phonogram *x'*, and in order that after traversing said phonogram from its initial point to the termination of the phonogram its stylus may not in its return motion again traverse the same a segmental cam *f*¹⁷ is fixed upon the shaft *f*⁹ and is or must be so arranged and timed that in the revolution of the shaft *f*⁹ it will act against the under faces of curved offsets *f*³ from the holder *f'* and lift the sound-box *f* upon its hinge *f*², and thus hold it during its return traverse to its starting-point, when said cam will allow the sound-box to descend, with its reproducing-stylus again in engagement with the phonogram *x'*. In the event of the electric circuit being broken, for example, at the exchange by ringing off after the delivery of the message and at the termination of the outer traverse of the sound-box at the distant station and before the sound-box has returned to its zero-point, the next ringing-up and completion of the circuit will cause the sound-box to return to zero and again reproduce the message, and so on.

In order to enable the recording instrument

d e at the distant station to be brought into action, assuming it to have been thrown out of action by turning the handle k^8 and raising the slide-bar k and disengaging the feed mechanism $g^3 h$, as hereinbefore described, the following simple device is employed, which is represented at Figs. 8 and 9: Upon the shaft k^5 , in addition to the cam k^6 , formed with the nose or point k^7 , is a disk k^{10} , provided with a notch k^{11} , and in connection therewith is employed a hook n , mounted upon an axis of motion n' , carried by the armature n^3 of an electromagnet n^4 , and which is kept up to its work by a spring n^2 , and the tooth of the hook in the acting position of the nose k^7 of the cam k^6 —that is, when the slide-bar k is raised—engages the notch k^{11} of the disk k^{10} . When magnet n^4 is sufficiently energized, it starts rotation of the disk k^{10} till nose k^7 is thrown beyond its center of support, when the parts will assume the position shown in Fig. 8 under the weight of the carriage-bar k^8 . The electromagnet n^4 is placed in the ordinary telephone-circuit, but is so formed or arranged that the ordinary current is not sufficient to actuate it in the manner desired, but at each station is provided a supplemental battery or other source of additional electricity, which is adapted to be brought into the ordinary circuit by the pressing of a button, by which means the electromagnet n^4 will be caused to attract the armature n^3 , and the hook n will rotate the disk k^{10} and shaft k^5 sufficiently to dislodge the nose k^7 of the cam k^6 from the bar k^2 , thereby permitting the instrument *d e* to descend into position for use.

It will be obvious that any other well-known electrical device may be employed for effecting the above object.

As a modification of this device the instrument *d e* may be automatically thrown into and out of action, for example, by the following means: The bar k^2 and instrument *d e* may be normally held raised by a spring and the armature n^3 connected to the bar k^2 , so that while the button at the distant station is depressed the armature n^3 will be attracted by the magnet n^4 , which must be of a powerful character, and the instrument *d e* will be held in action, while immediately that said button is released the instrument will be raised out of action by the spring. This arrangement of parts is so easily understood that it is not thought necessary to illustrate the same.

By the means hereinbefore described a telephonic message could be recorded without the presence of a person being necessary at that instrument for the time being the receiving instrument in the following manner: After office hours or in the event of an office having a telephonograph being left temporarily unattended a short phonogram-cylinder, such as x' , would previously be placed upon the mandrel i , as indicated by the dotted lines in Fig. 2, said phonogram bearing the required short

message—such, for example, as the following: “Nobody in. Mr. Brown will be back at four o’clock. Please press the button and I will take the message, and Mr. Brown will ring you up when he arrives.” The person (Mr. Brown) at the home station would then press in the knob m^3 , thus bringing the diaphragm f into action, after which he would be free to go out. The person at the distant station desiring to communicate with Mr. Brown would then ring up the exchange and the exchange would ring up Mr. Brown’s switch in Brown’s circuit, thereby completing the circuit through Brown’s actuating-motor and starting the instrument and causing the above message to be conveyed, by the diaphragm f , conduit f^* , and line-wire b^* , to the distant station. The person at the distant station finding that Mr. Brown was out and wishing to leave a message with him would then press the button, which would have the effect of bringing into action the electromagnet n^4 and lowering the instrument *d e* into position for use, as hereinbefore described, and he could then send his message over the line-wire to the home station, where it would be recorded by the instrument *d e* upon the phonogram-blank x . He would then ring off and exchange would cut out Brown’s circuit, thus arresting the actuating-motor, and the repeating diaphragm, with the repeating sound-box f , would in the next ringing up automatically return to its initial position and again traverse the phonogram x' and repeat to any subsequent caller at any other distant station the same answer previously mentioned. Upon Mr. Brown’s return to office he would see that the pointer j^3 of the instrument *d e* had moved with relation to the scale a^* , and this circumstance would tell him that some one had left a message with his machine while he had been out, and he could then by switching on the motor and bringing into action the reproducing-point e^3 of the instrument *d e* and listening at the listening-tube d^* hear the message reproduced.

It will be understood that the details of construction and arrangement of the various parts of the apparatus are capable of considerable modification without departing from the principle of the invention. For example, the sound-waves might be electrically conveyed from the transmitter b to the recording instrument *d e*; but this arrangement is considered inferior to that hereinbefore described.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A combined telephonic and phonographic instrument comprising phonographic and electrotelephonic diaphragms connected together to cause either to be actuated by the other, sound-boxes containing said diaphragms and connected together by a tube, a mouthpiece provided with a telephonic trans-

mitter and a sound-duct from the mouthpiece to the connecting-tube of the aforesaid sound-boxes; substantially as and for the purposes set forth.

5 2. In combination with a phonograph having a suitable carriage and a sound-box mounted on said carriage and containing a diaphragm and stylus connected with said diaphragm, a telephonic receiver also mounted
10 upon said carriage, and having its sound-box in communication with the sound-box of the phonograph by a duct and a telephonic transmitter having a mouthpiece which is also in
15 between the sound-boxes on the phonograph-carriage; substantially as herein set forth.

3. In combination with a phonograph having a suitable carriage, and a recorder mounted thereon, a telephonic receiver also mounted
20 on said carriage and in communication with the recorder, a telephonic transmitter having a mouthpiece, which is in communication with both the receiver and recorder on the carriage, and an additional phonographic
25 instrument mounted independently of the said carriage and communicating with the telephonic transmitter; substantially as and for the purposes set forth.

4. In an instrument of the character described, comprising a telephone and a phonograph, an electrically-actuated means for throwing the phonograph into action, consisting of a rotating cam by which the phonograph-carriage is normally held out of action,
35 an electromagnet and an armature therefor, and a hook connected with said armature and engaging said cam; substantially as set forth.

5. In a phonograph the combination of the guide-bar k , the posts l , upon which said
40 guide-bar is mounted by slot-and-pin connection, the bar k^2 supporting said bar k , the guide-links k^4 connecting bar k^2 with fixed points, and the lifting-cam k^6 ; substantially as and for the purpose set forth.

45 6. In a phonograph the combination of the bar k , the posts l upon which said bar is mounted by slot-and-pin connection, the bar k^2 supporting said bar k , the guide-links k^4 connecting bar k^2 with fixed points, the lift-

ing-cam k^6 , a hook n , engaging said cam, and
50 an electromagnet controlling said hook.

7. In a phonograph the combination with a stylus, of the floating weight suitably pivoted at one end and providing at an intermediate
55 point a mounting for the stylus, a stop limiting the movement of the free end of the weight in one direction, a spring pressing said free end toward said stop, and a set-screw applying pressure to the spring; substantially
60 as and for the purposes set forth.

8. In combination with a phonograph and a sound-box having movement perpendicular and parallel to the surface of the record, the rotating segment for raising the sound-box during its movement in one direction; sub-
65 stantially as and for the purposes set forth.

9. In combination with a phonograph having a sound-box movable both perpendicularly and parallel to the record, a rotating cam imparting said parallel movement in one di-
70 rection, means for imparting said parallel movement in the opposite direction, and a rotating segment elevating the sound-box during the movement by the cam; substantially
75 as set forth.

10. In a phonograph the combination of a sound-box movable perpendicularly and parallel to the record, a spring imparting the parallel movement in one direction, a shaft bearing a cam which moves the sound-box in op-
80 position to the spring, and a lifting-segment also carried by said shaft, rotating with the cam and elevating the sound-box during the movement by the cam; substantially as and
85 for the purpose set forth.

11. In a phonograph the combination with a sound-box movable to and from the record, the pivoted lever m engaging beneath the sound-box to hold it in elevated position, and the push-rod m^2 connected at its end with the
90 lever, and movable longitudinally to control the position of said lever relatively to the sound-box; substantially as set forth.

JULES ERNEST OTHON KUMBERG.

Witnesses:

C. MELBOURNE WHITE,
THOMAS V. GRAFTON.

.

No. 636,822.

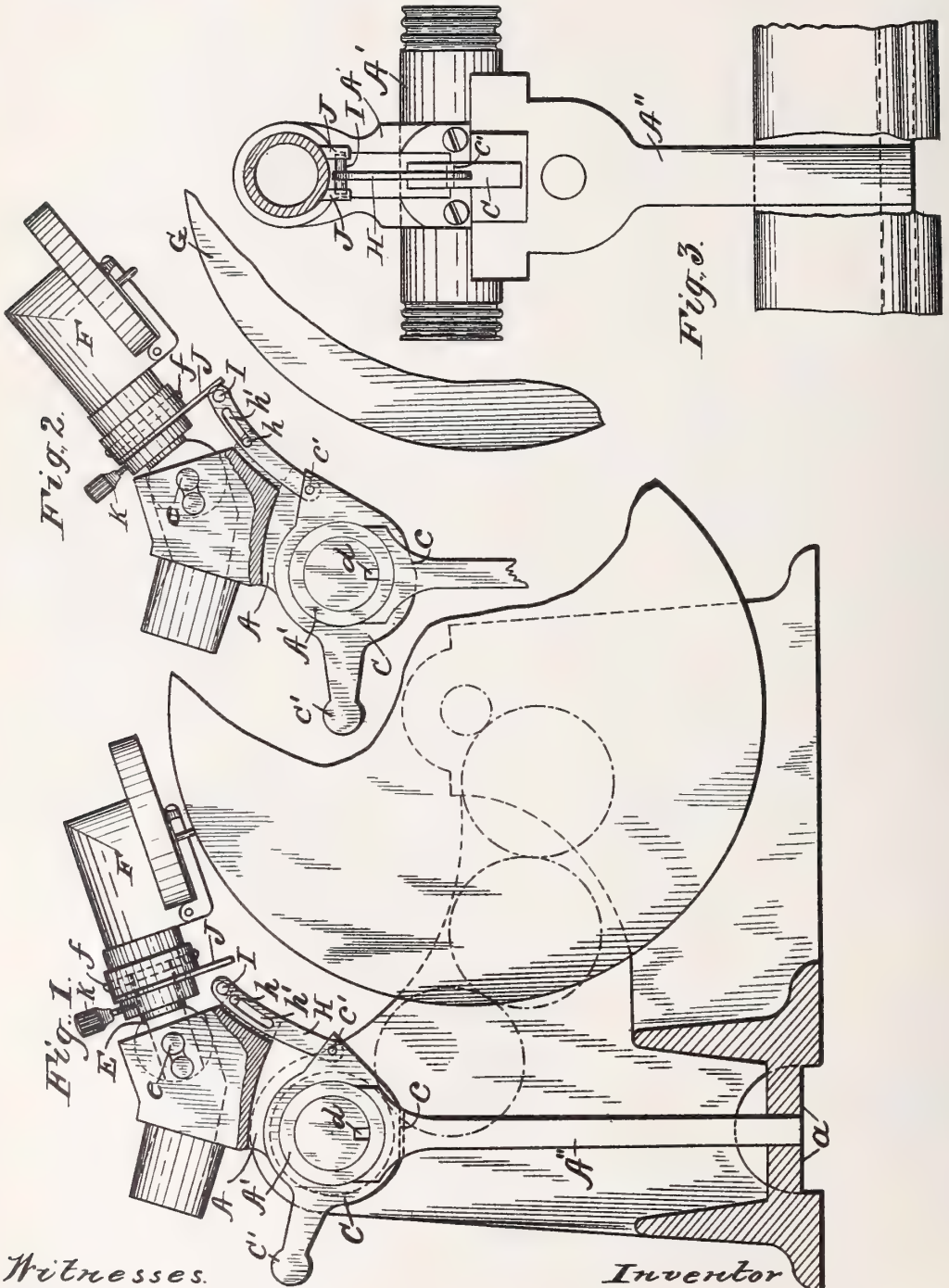
Patented Nov. 14, 1899.

T. H. MACDONALD.

LIFTING MECHANISM FOR GRAPHOPHONE REPRODUCERS.

(Application filed May 26, 1899.)

(No Model.)



Witnesses.
W. R. Engelen.
[Signature]

Inventor
Thomas H. Macdonald
by *Philip H. H. H.*
his attorney

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT
OF COLUMBIA.

LIFTING MECHANISM FOR GRAPHOPHONE-REPRODUCERS.

SPECIFICATION forming part of Letters Patent No. 636,822, dated November 14, 1899.

Application filed May 26, 1899. Serial No. 718,358. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a citizen of the United States, residing at Bridgeport, Connecticut, have invented a new and useful Lifting Mechanism for Graphophone-Reproducers, which is fully set forth in the following specification.

This invention relates to graphophones, and more particularly to improvements in the mechanism for lifting the reproducer. In the present construction (of which Letters Patent No. 569,290, granted to me October 13, 1896, may be taken as an illustration) the reproducer-head is connected to its carriage by an intermediate tubular piece or neck on which it is mounted by a vertical pivot, so as to have lateral play, while the tubular neck is itself secured to the carriage by a horizontal pivot, so as to have vertical play, these pivots providing the "universal joint" essential to practical reproducers. Depending from this intermediate neck is a projection adapted to be raised by a cam on the stop-ring, thus lifting the reproducer-head. When the reproducer is lifted, it is still free to play on its vertical pivot, and has a tendency to swing to one side, so that when it is dropped back on the sound-record the reproducer-point does not lie in the center of its play or rest truly on the record. The present invention obviates this defect; and it consists in lifting the reproducer-head itself instead of the intermediate neck and in supporting the head at more than one point.

A preferred form of my invention is shown in the annexed drawings, in which—

Figure 1 is a partly-broken side elevation of the carriage and adjacent parts. Fig. 2 is a similar view showing the reproducer lifted away from the sound-record, and Fig. 3 is an elevation.

Referring to the drawings, A is the carriage, and A' its sleeve sliding on the slotted tube that surrounds the feed-screw. (Not shown.) A'' is a depending arm fast to sleeve A' and sliding between guides a. C is the stop-ring seated in a slot in the carriage and turning on sleeve A'. The usual Y-shaped piece, seated in arm A'' and spanning ring C, is pressed upward by a spring and provided on

its upper faces with partial nuts d d for engaging the feed-screw. On ring C is the usual cam c. The tubular neck E is pivoted at e in the sound-conveying tube of the carriage, and the reproducer-head F engages neck E by the substantially vertical pivot f, pivots e and f permitting universal movement for the reproducer-head. G is the (cylindrical) sound-record. All this construction is old.

Describing now the novel features, a lifting-bar or plunger H is connected with ring C, as by pivot c', and slides in a recess in the carriage, in which it is held by pin h and slot h'. At the upper end of plunger H is a horizontal pin I, projecting on each side of the plunger. Two substantially parallel arms J J, fast on the reproducer-head, project downward, being so located as to straddle the end of plunger H and be engaged simultaneously by the ends of pin I, as indicated by Fig. 2.

K is a catch for holding head F to neck E.

The operation is as follows: In Fig. 1 the cam c allows partial nuts d d to engage the feed-screw while the reproducer-point is in operative contact with the sound-record G. When the handle C' of the stop-ring C is depressed, Fig. 2, the thick portion of the ring forces nuts d d down out of engagement with the feed-screw and at the same time the plunger H is moved upward, pin I engaging arms J J, which it pushes up, lifting the whole reproducer from the pivot e. The reproducer-head being supported directly and at two points, there is no tendency for it to swing to either side, so that when handle C' is raised and the reverse of the operation just described takes place the reproducer is lowered truly and accurately upon the sound-record.

I do not wish to limit myself to the exact construction and arrangement shown, as any construction that lifts the reproducer-head itself or that supports it at the middle of its lateral play is within the spirit of my invention.

Having thus described my invention, I claim—

1. In a graphophone, the combination with the reproducer-head, with a mounting therefor that permits it both vertical and lateral play, of mechanism for lifting the said repro-

ducer-head and supporting the same at two points, substantially as described.

2. In a graphophone, the combination of the reproducer-carriage, the tubular neck secured thereto by a horizontal pivot, the reproducer-head engaging said neck by a substantially vertical pivot, and lifting mechanism adapted to hold said head (when lifted) at the center of its lateral play, substantially as described.

3. In a graphophone, the combination with the reproducer-carriage, the intermediate tubular neck secured thereto by a horizontal pivot, the reproducer-head engaging said neck by a substantially vertical pivot, and the stop-ring seated in the carriage, of a plunger actuated by said ring, two parallel arms depending from said reproducer-head, and a

transverse pin in the end of said plunger adapted to engage with said arms to lift the reproducer-head and support it in the center of its lateral play, substantially as described.

4. In a talking-machine, the combination with the reproducing-stylus, and a mounting therefor that permits it both vertical and lateral play, of a single mechanical part for lifting said stylus and holding it (when lifted) at the center of its lateral play, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

ALBERT C. KNAPP,
W. R. MILLER.

No. 637,196.

Patented Nov. 14, 1899.

E. BERLINER.
GRAMOPHONE SOUND BOX.

(Application filed Sept. 17, 1897.)

(No Model.)

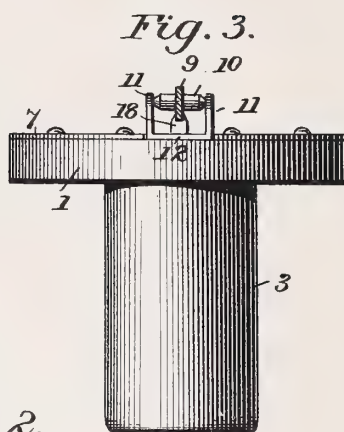
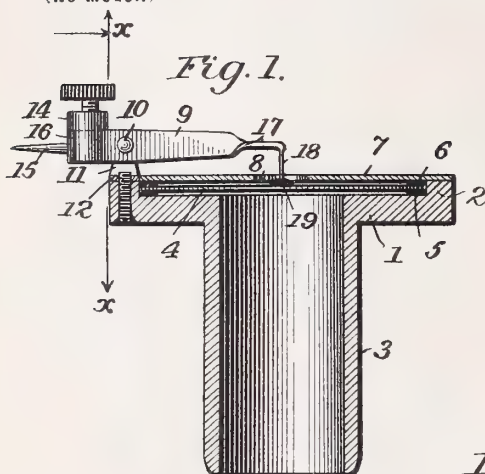


Fig. 2.

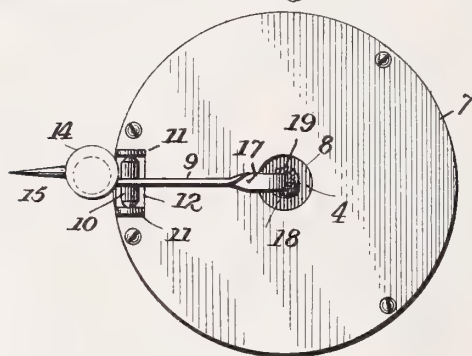


Fig. 4.

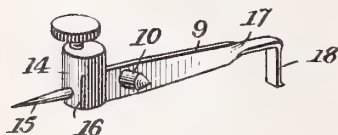


Fig. 5.

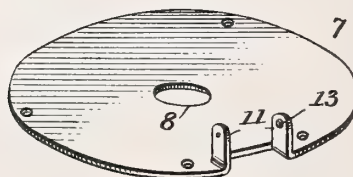


Fig. 6.

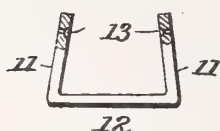


Fig. 7.

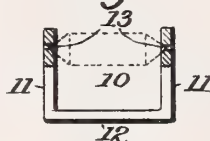
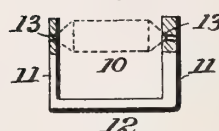


Fig. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
TO THE UNITED STATES GRAMOPHONE COMPANY, OF SAME PLACE.

GRAMOPHONE SOUND-BOX.

SPECIFICATION forming part of Letters Patent No. 637,196, dated November 14, 1899.

Application filed September 17, 1897. Serial No. 651,968. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, and a resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Gramophone Sound-Boxes, of which the following is a specification.

This invention has reference to sound-boxes for gramophones, and is an improvement upon the sound-boxes shown and described in my Letters Patent No. 534,543, granted February 19, 1895.

In gramophones the sound-record is produced in the form of a sinuous line of even depth, usually arranged spirally upon a flat disk of suitable material. The receiving or reproducing diaphragm is placed at right angles to the face of the disk, so as to vibrate in a plane parallel to the disk. The vibrations or waves to be recorded or reproduced are transmitted from the diaphragm to the disk, or vice versa, by means of a lever carried by the sound-box and carrying at one end a stylus engaging the disk. This lever may be of the second order, as in the patent above referred to, or it may be of the first order, as in the present invention; but whatever its form, the vibrations, due to sounds to be recorded or reproduced, are transmitted between the diaphragm and disk by means of the lever.

In the present improvement I use a lever of the first order, since I find, among other things, that it is possible by properly proportioning the leverage to considerably amplify the sounds, especially when the sound-box is designed for reproduction. I have also found that a lever of the first order must be fixed at the inner end securely to the diaphragm, so that there may be no lost motion, and it is mainly to this connection between the stylus-carrying lever and the diaphragm that the present invention is directed. This connection between the inner end of the lever and the diaphragm is of vital importance, since the lever in moving about its pivot travels through an arc at the point where it is connected to the diaphragm, and if this connection be a rigid one the diaphragm is put under a strain, due to the apparent shortening of

the lever, except at the instant when it is parallel to the diaphragm. This I have found to be detrimental to the clear and sharp recording or reproduction of sound. I have overcome this objectionable feature by making the connection between the lever and the diaphragm flexible in the direction of the length of the lever, whereby the apparent shortening of the said lever is neutralized. At the same time this connection must be rigidly secured to the diaphragm and lever and must also be rigid in the plane of vibration of the lever, so that there may be no lost motion. Such a connection I have produced by making it in the form of a flat spring constituting an integral part of the lever, and the free end of this spring I securely cement or otherwise attach to the diaphragm. It is also necessary that the lever should have a fulcrum which permits a free and unrestrained movement of the lever. A fulcrum of the blade-spring type with a normal bias would tend to hold the lever in a given position and to return it to that position when moved therefrom. This would distort the motion of the diaphragm and interfere with perfect sound recording or reproduction. The diaphragm is thus relieved from all strain and is thereby made more responsive to delicate vibrations, whereby a more faithful record of sound or reproduction of recorded sound is obtained.

This improvement and other related improvements in sound-boxes are fully set forth in the following detail description with reference to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a central section of the sound-box. Fig. 2 is a top plan view. Fig. 3 is a side elevation, with the lever or stylus-carrier in section on the line xx of Fig. 1. Fig. 4 is a perspective view of the lever or stylus-carrier. Fig. 5 is a perspective view of a modified form of the top plate of the sound-box. Figs. 6 and 7 are views of the pivot-support for the lever or stylus-carrier, and Fig. 8 is a view of a modified form of the said pivot-support.

Referring to the drawings, there is shown a sound-box body composed of a flat circular head 1, with a peripheral ledge 2 on one face

and a neck 3 projecting centrally from the other face. A central opening through the head and neck forms the passage for the sound-waves. The neck and ledge may be formed in one piece with the head or either or both may be separately formed and secured to the said head. A diaphragm 4, of mica, metal, or other material and of such size as to easily fit inside the ledge, is carried by the head, but is held from direct contact therewith by an elastic ring 5, of rubber, felt, or other material. Another similar ring 6 is placed upon the diaphragm, and the whole is firmly clamped in place in the shallow chamber or recess formed by the ledge 2 by means of a top plate 7, secured by screws or otherwise to the ledge. The top plate has a small central perforation 8 for the passage of a connection between the lever or stylus-carrier and the diaphragm.

The stylus-carrier is composed of a lever 9, formed of a flat piece of metal tapering toward one end and set edgewise relative to the diaphragm, with its plane of vibration at right angles to the diaphragm, so as to be as stiff as possible in that direction. Near its wide end the lever is provided with a double-pointed pivot-pin 10 and is passed through the lever and soldered or otherwise secured to it. This pivot-pin is grasped by the upturned prongs 11 of a U-shaped yoke-piece 12, secured to the ledge 2 by a screw, as shown, or otherwise, the top plate 7 being notched or cut away at one edge to fit around this yoke-piece. The two upturned prongs 11 of the yoke-piece have each a conical seat 13 for the corresponding pointed or tapered end of the pivot-pin. In order to hold the pivot firmly against rattling and at the same time allow freedom of movement on its axis, one or both of the prongs 11 have a normal slight inward spring, so as to grasp the pivot with the requisite degree of pressure.

The fulcrum which I employ has no bias or trend to return the lever to a given normal position. I therefore designate it as a "non-biased" fulcrum. This is especially important when the spring construction between the end of the lever and the diaphragm is considered.

The inward spring of the prongs 11 of the yoke-piece 12 is shown somewhat exaggerated in Fig. 6, and the position assumed by the prongs when the pivot is in place is indicated in Fig. 7.

The stylus-lever carries at its wide or outer end a binding-post or clamp 14, which is arranged to receive a stylus 15, shown in the drawings as a simple needle-point, which is the form used when the sound-box is employed for the reproduction of recorded sounds. The thumb-screw of the binding-post or clamp and the perforation for the insertion of the stylus are at one side of the center of the body of the binding-post, so as to provide room for securing the binding-post to the stylus-lever in the manner shown. The body of the bind-

ing-post is slit, as shown at 16, and in this slit the end of the stylus-lever is placed, and the binding-post is then soldered or otherwise secured to the lever.

The narrow or inner end of the stylus-lever is twisted a quarter-turn, as shown at 17, and terminates in a portion 18, bent at right angles to the main portion of the lever and extending in the plane of vibration of the latter. The portion 18 serves as the connection between the lever and diaphragm, being secured to the latter by a drop of wax, pitch, or the like when a mica diaphragm is used or by a drop of solder or otherwise when a metal diaphragm is used. This cementing or soldering material is indicated at 19. The connection 18 is here shown as an integral part of the lever and is secured as firmly as possible to the diaphragm, so that there may be no lost motion to injuriously modify the sound-waves. It is, however, clear that the flexible connection between the diaphragm and the lever or stylus-carrier proper need not necessarily be integral with the latter; but in that case it must be rigidly secured to it in any suitable manner.

It will be understood that the stylus-lever is vibrated around its pivot, and consequently the inner end of the stylus-lever moves through an arc commensurate with the amplitude of said vibrations. As hereinbefore stated, I have found that though the arc described by the inner end of the stylus-lever is minute, still the relation between the lever vibrating in a curved path and the center of the diaphragm vibrating in a straight path is so changed that unless compensated for it has an injurious effect upon the character of the sound-waves, since the diaphragm is put under a strain that does not correspond to the said sound-waves. For this reason I make the connection 18 for the greater portion of its length in the form of a thin flexible flat spring, as indicated, so that it will compensate for the curved path of the inner end of the lever. At the same time this spring connection, being practically at right angles to the diaphragm, is stiff enough in the direction of the plane of vibration to resist any tendency to buckle.

I have shown in Figs. 5 and 8 two modifications of the pivot-bearings for the stylus-lever. In Fig. 5 the upturned socketed or perforated prongs 11 are formed by being struck up from the top plate 7, and they are similar to and perform the same function as those described with reference to Figs. 6 and 7. In Fig. 8 one of the prongs is made heavier than the other and only one of them has an inward spring. This form will be used with reproducing sound-boxes, for in the reproducing-gramophone the uppermost pivot-support must sustain the greater portion of the weight of the reproducing sound-box and associated parts, as will be evident from an inspection of the aforesaid Letters Patent.

While I have shown and prefer to use the

stylus made detachable from the lever or stylus-carrier, it is quite clear that the lever and stylus may be made integral without departing from my invention.

5 Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a gramophone sound-box, the combination of a diaphragm, a lever having a non-
10 biased fulcrum, for conveying vibrations to or from a record-surface, and a spring connection, between the lever and diaphragm, flexible in the direction of the length of the lever, substantially as described.

15 2. In a gramophone sound-box, the combination of a diaphragm, a lever having a non-biased fulcrum, for conveying vibrations to or from a record-surface, and a connection between the lever and diaphragm consisting of
20 a spring integral with the lever and flexible

in the direction of the length of the same, substantially as described.

3. A sound-box for gramophones, comprising a diaphragm, a stylus-lever having a non-
25 biased fulcrum, connected to the diaphragm by a spring forming an integral part of and flexible in the direction of the length of the lever, and a support for the lever consisting of two opposing bearings provided with seats for a pivot-pin on the lever and grasping the
30 same with spring-pressure, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:

HENRY E. COOPER,
F. T. CHAPMAN.

No. 637,197

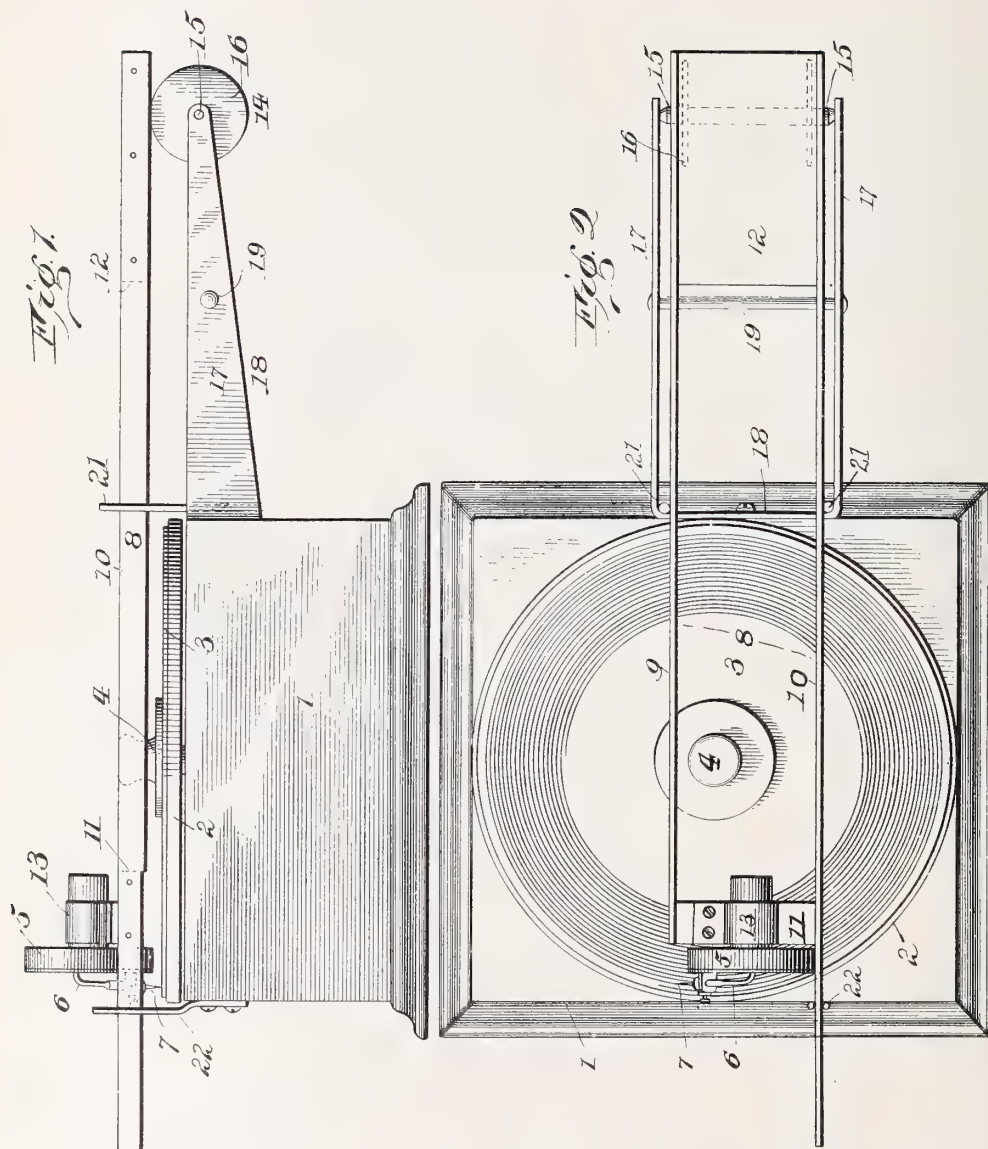
E. BERLINER.
GRAMOPHONE, &c.

Patented Nov. 14, 1899.

(No Model.)

(Application filed Jan. 25, 1899.)

2 Sheets—Sheet 1.



Witnesses:
J. M. Fowler
F. T. Chapman

Inventor:
Emile Berliner;
By Lyons & Bisping,
Attorneys.

No. 637,197.

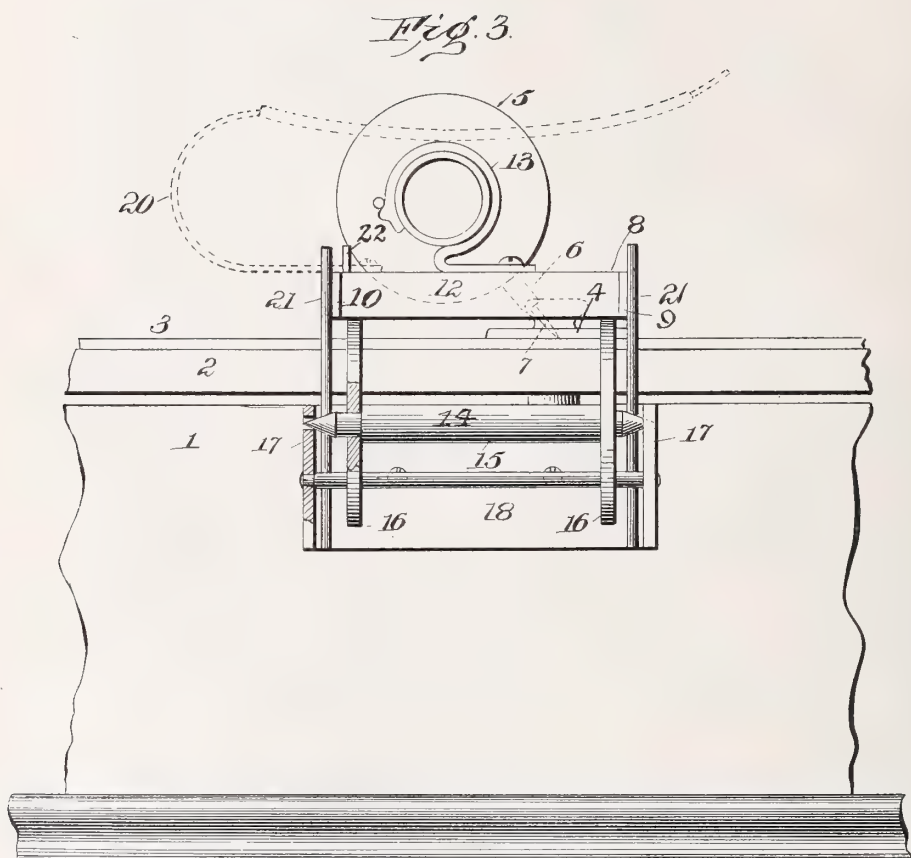
Patented Nov. 14, 1899.

E. BERLINER.
GRAMOPHONE, &c.

(Application filed Jan. 25, 1899.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses:
J. M. Fowler Jr.
F. T. Chapman.

Inventor:
Emile Berliner,
By Lyons & Bisson
Attorneys.

UNITED STATES PATENT OFFICE.

EMILE BERLINER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
TO THE UNITED STATES GRAMOPHONE COMPANY, OF SAME PLACE.

GRAMOPHONE, &c.

SPECIFICATION forming part of Letters Patent No. 637,197, dated November 14, 1899.

Application filed January 25, 1899. Serial No. 703,347. (No model.)

To all whom it may concern:

Be it known that I, EMILE BERLINER, a citizen of the United States, and a resident of Washington, in the District of Columbia, have
5 invented certain new and useful Improvements in Gramophones or other Sound-Reproducing Machines, of which the following is a specification.

This invention has reference to improvements in sound-reproducing machines, and especially to the gramophone-reproducers using a flat record-disk with the record thereon in the form of a sinuous spiral groove of even depth having the sound-waves represented
15 by the sinuosities of the groove.

It is a characteristic feature of the gramophone-reproducer that all special mechanism for feeding the sound-box (comprising the diaphragm or other resonant body and reproducing-stylus) across the record-disk is dispensed with, and the record-groove itself is utilized as a feed-screw of great delicacy, and since the feed-screw and the record-groove are one and the same no justifying devices
25 of any kind for inaccuracies between the feeding mechanism and the record-groove are required. However, since in the commercial gramophone-reproducer the sound-box is carried at the outer end of a simple hinged arm which is free to be swung around its hinge, so as to be fed by the groove across the record-disk, the sound-box is necessarily carried thereby through an arc of more or less curvature, according to the length of the arm.
30 For commercial use this arm must be of limited length to make the reproducing-machine as compact as possible, and consequently the curvature of the path of the reproducing-stylus across the record-tablet is quite pronounced and varies considerably from the path of the recording-stylus, which is fed in a straight line radially across the disk upon which the record is first produced.

While it is practical to have the reproducer-stylus travel through a curved path over the record-disk, still the reproduction is not as perfect as when the path of the reproducer-stylus conforms with the path of the recorder-stylus, for when the reproducer-stylus travels through a curved path it has a
50

more or less distorted relation to the sound-record.

I have heretofore provided means for feeding the reproducer sound-box in a radial line across the record-tablet by the action of the record-groove as a feed-screw upon the stylus, as shown in my Letters Patent No. 564,586, dated July 28, 1896, and the same purpose was sought to be achieved by a system of interconnected links constituting a lever, as shown in the patent to W. Suess, No. 427,279, dated May 6, 1890; but both of these means for propelling the reproducer sound-box in a radial line across the record-tablet are inconvenient in some respects for commercial purposes; and it is the object of the present invention to achieve the same purpose by a construction that is free of the inconvenience inherent in those heretofore used, as suggested, for the same purpose. For this purpose I so mount the sound-box carrier that it is free to be propelled across the record-tablet in a straight line by the engagement of the reproducer-stylus with the record-groove, and at the same time it is free to be moved in a direction perpendicular or approximately perpendicular to the surface of the record-tablet; but both movements are always in the same perpendicular plane relative to the surface of the record-tablet.

When I speak of a plane whose direction is perpendicular to the surface of the record-tablet, I naturally mean to include planes which are nearly or substantially perpendicular to the surface of the record-tablet.

For the practical embodiment of my invention I am not confined to any special mechanism, since I have devised a number of different forms of sound-box carriers and supports therefor that will operate in accordance with my invention; but in order to simplify both the illustration and description of the invention I have shown in the accompanying drawings but one embodiment of the invention, which in practice has been found to give excellent results.

In the drawings, Figure 1 is a side elevation of a gramophone-reproducer embodying the present invention. Fig. 2 is a plan view thereof; and Fig. 3 is an end view, on a larger

scale, of the sound-box carrier and its support and adjacent parts.

Referring to the drawings, there is shown a motor-case 1, containing the usual spring-motor (not shown) for actuating a horizontal rotary table 2 on top the motor-case. The table 2 supports a flat record tablet or disk 3, secured thereto by a clamp-nut 4. The record-disk is of the usual circular type, having on its face a sinuous spiral groove of even depth, with the sound-waves represented by the sinuosities of the groove. The sound-box 5 is of the ordinary construction used in the gramophone-reproducer—that is, it contains a suitable diaphragm, (not shown,) to which a lever-like arm 6 is attached, and the latter carries a stylus 7, shaped for engagement by the record groove on the face of the tablet. As thus far described the structure shown in the drawings is the same in all respects as the ordinary commercial gramophone, and consequently no detail description of the construction and operation of these parts is deemed necessary.

The sound-box 5 is carried by an arm 8, composed of two narrow, preferably metallic, strips 9 10 and two spacing-blocks 11 12, preferably of wood or other light material. The two strips 9 10 are secured at the outer end of the arm 8 to the spacing-block 12, which is as long as or longer than the greatest width of a record upon the record-tablet, for a purpose that will hereinafter appear. The other spacing-block 11, as shown, is shorter than the spacing-block 12 and need only be long enough in the direction of the length of the arm 8 to hold a spring-clip 13, which receives the neck of and holds the sound-box in place in such manner that the stylus will rest in a record-groove in the usual manner.

The spacing-block 11 is secured to the strips 9 10 at the inner end of the arm 8; but the strip 10 is longer than the strip 9 and projects beyond the end of the arm 8, in line with the same, a distance equal to or longer than the greatest width of a record upon the record-tablet, the purpose of which will also appear farther on.

The outer end of the arm 8, by the spacing-block 12, is supported upon a roller 14 in such manner as to be freely movable lengthwise and also to be freely rocked up and down on the roller, the surface of which thus forms a shifting fulcrum. The roller is composed of an axle 15, having two disks 16 16 fast on it near its two ends, which are so spaced as to afford a broad bearing for the spacing-block 12. The ends of the axle 15 project beyond the disks and are there pointed, as shown, or are otherwise shaped to fit in suitable bearings in the ends of two parallel side arms 17 17 of a bracket 18, secured to the motor-box 1. At an intermediate point in the side arms 17 there is secured a stiffening-rod 19, as shown.

When the ordinary sound-amplifying horn (not shown) is placed upon the machine, one

end is attached to and supported by the neck of the sound-box and the other end rests upon a bracket 20 on the outer end of the arm 8.

Fast on the inner corners of the bracket 18 and rising therefrom above the arm 8 are two rods 21 21, so arranged as to embrace the arm 8 about midway of its length, but in such manner as to not impede the lengthwise movement of the said arm, and rising from the motor-case 1, beyond the inner end of the arm 8, is a forked guide 22, through which the extension of the strip 10 passes.

The purpose of the rods 21 and forked guide 22 is to resist the drag of the rotating record-tablet on the stylus and through the latter on the sound-box and inner end of the arm 8, which drag acts at right angles to the length of the arm and tends to move the same laterally on the roller; but neither the rods 21 nor the guide 22 prevents the arm 8 from being propelled lengthwise by the record-groove across the face of the record-tablet or from being moved on the roller in a direction perpendicular or approximately perpendicular to the surface of the record-tablet. Consequently all movements of the arm 8 and of the sound-box carried thereby are confined to a single plane that is perpendicular to the face of the record-tablet, since it is evident that all other movements are effectually prevented by the rods 21 and forked guide 22. The stylus must therefore move across the face of the record-tablet in a straight line, and as this line is made to coincide with a radius of the tablet the path of the reproducing-stylus will agree in all respects with the path of the recording-stylus across the face of the tablet when the record is first produced, thereby preventing all distortion of the reproduced sound due to the stylus having a curved path across the record-tablet.

The foregoing description is confined to the particular structure shown in the drawings, since the principle of the invention is apparent therefrom; but it will be understood that any structure in which the stylus and sound-box are fed across the record-tablet by the record-groove and at the same time are free to be moved in a direction perpendicular or approximately perpendicular to the surface of the record-tablet, but in the same plane as the movement across the tablet, I consider as embodying my invention. It will also be understood that the invention is equally applicable to sound-reproducers using cylindrical tablets as well as flat tablets and to tablets with the record in the form of a groove of varying depth instead of in the form of a sinuous groove of even depth. It will also be understood that I consider a sound-record in the form of or formed in a ridge as the equivalent of a sound-record in the form of or formed in a groove.

Having thus fully described the invention, what I claim is—

1. In a gramophone or other device for reproducing sound from a record of the same,

a sound-box and stylus free to be fed across the record-tablet by the record-groove and mounted to freely move toward and from, but restrained to move solely in a plane perpendicular to, the surface of the record-tablet, substantially as described.

2. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, with a reproducing sound-box mounted to be propelled across the tablet, by the record-groove, in a straight line and mounted to freely move toward and from, but restrained to move solely in a plane perpendicular to, the surface of the record-tablet substantially as described.

3. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box, and a mounting therefor free to be propelled by the record, comprising an arm carrying the sound-box, a bearing or support for the arm permitting the latter to move freely toward and from, but restraining it to move solely in a plane perpendicular to, the surface of the record-tablet, substantially as described.

4. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box, and a mounting therefor free to be propelled by the record, comprising an arm carrying the sound-box, a bearing or support for the arm, and guides or stops for the arm permitting free motion of the arm toward and from, but restraining it to move solely in a plane perpendicular to, the surface of the record-tablet, substantially as described.

5. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box, and a mounting therefor comprising an arm carrying the sound-box, a roller or antifriction bearing or support for the arm, and means permitting free motion of the arm toward and from, but restraining it solely to a plane perpendicular to, the surface of the record-tablet, substantially as described.

6. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box, and a mounting therefor comprising an arm carrying the sound-box at one end, a roller supporting the arm at the other end, and guides or stops permitting free motion of the arm toward and from, but restraining it to a

plane perpendicular to, the surface of the record-tablet, substantially as described.

7. In a gramophone or other sound-reproducing machine, the combination of a horizontally-rotatable record-disk, a reproducing sound-box, and a mounting therefor comprising an arm carrying the sound-box, a bearing or support for the arm permitting the same to be moved lengthwise in a straight line and also up and down, and guides or stops restraining all movements of the arm to a single vertical plane, substantially as described.

8. In a gramophone or other sound-reproducing machine, the combination of a horizontally-rotatable record-disk, a reproducing sound-box, a mounting therefor comprising an arm carrying the sound-box, a roller-bearing for the arm on which the latter may be moved lengthwise and up and down, and guides or stops for the arm confining or restraining all movements of the latter to a single vertical plane, substantially as described.

9. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, a reproducing sound-box and a mounting therefor, free to be propelled by the record, comprising an arm, carrying the sound-box, a bearing or support for the arm permitting the latter to move toward and from the record-tablet in a plane perpendicular thereto and the stylus to rest by gravity against the record-tablet, and means for preventing the movement of the arm in any other plane, substantially as described.

10. In a gramophone or other sound-reproducing machine, the combination of a rotatable record-tablet, with a reproducing sound-box mounted to be propelled across the tablet, by the record-groove, in a straight line, and mounted to have its movements confined to a single plane, passing through that line perpendicular to the surface of the record-tablet and to have the stylus and sound-box rest by gravity against the record-tablet, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EMILE BERLINER.

Witnesses:

F. T. CHAPMAN,

HUGH M. STERLING.

638,674

No. 638,674.

L. ROSENTHAL.
PHONOGRAPH.

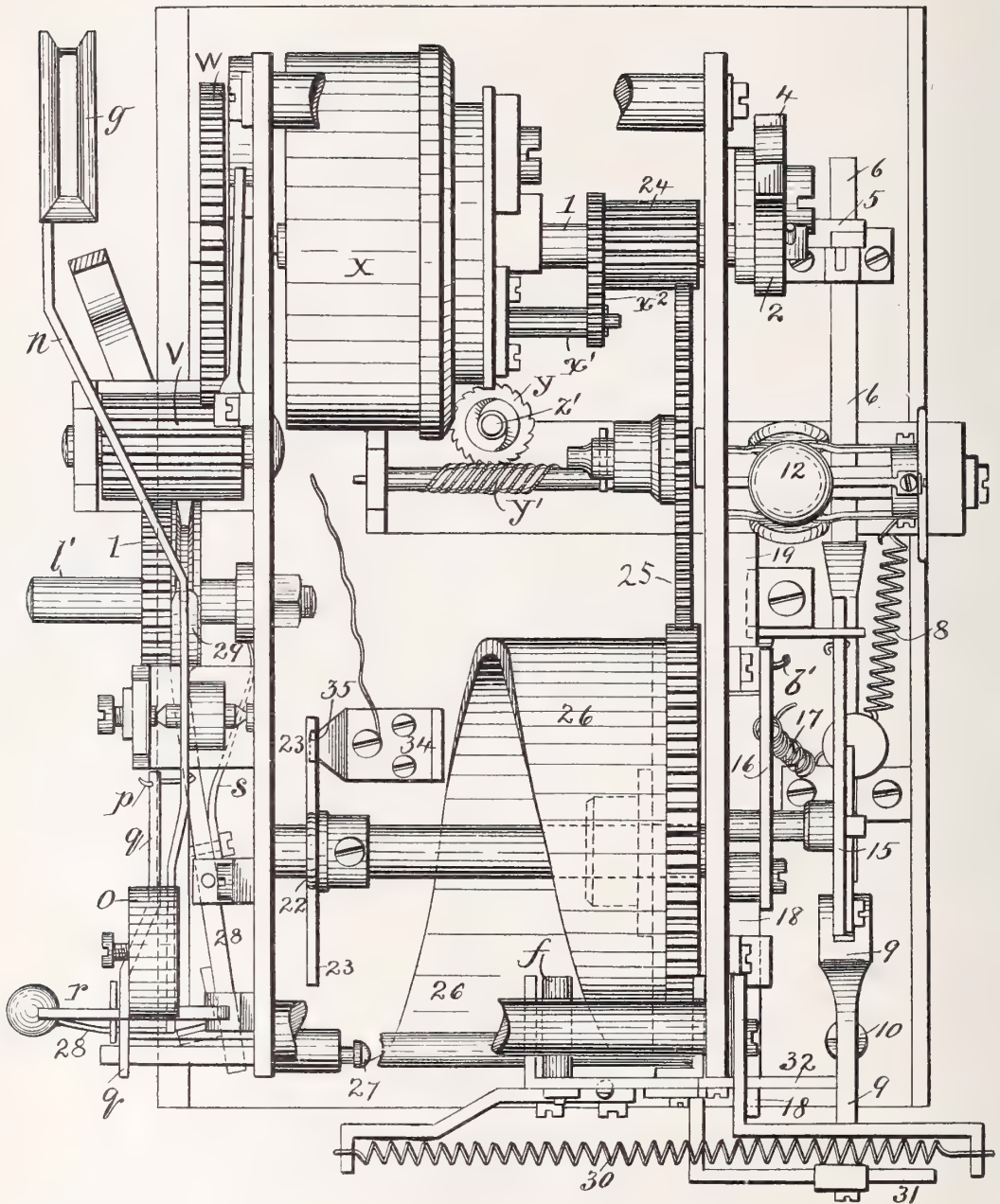
(Application filed Aug. 10, 1899.)

Patented Dec. 5, 1899.

(No Model.)

7 Sheets—Sheet 1.

Fig. 1



Witnesses
W. R. Edison
W. B. Lusk.

Inventor
Louis Rosenthal
by Philip Mauro
his attorney

No. 638,674.

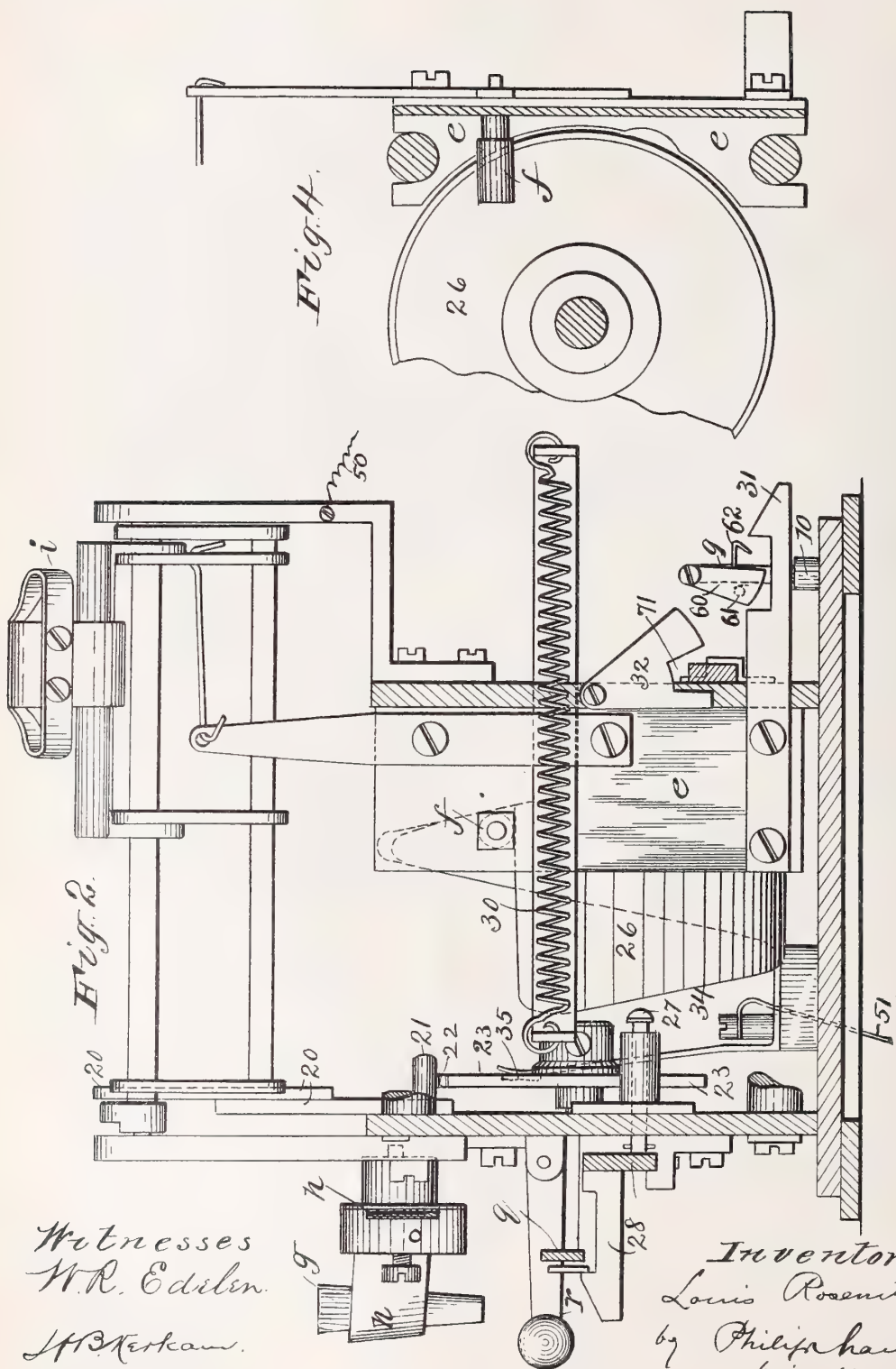
L. ROSENTHAL.
PHONOGRAPH.

Patented Dec. 5, 1899.

(No Model.)

(Application filed Aug. 10, 1899.)

7 Sheets—Sheet 2.



Witnesses
W.R. Edelen.
J.H. Kerkam.

Inventor
Louis Rosenthal
by Philip Harris
his attorney.

No. 638,674.

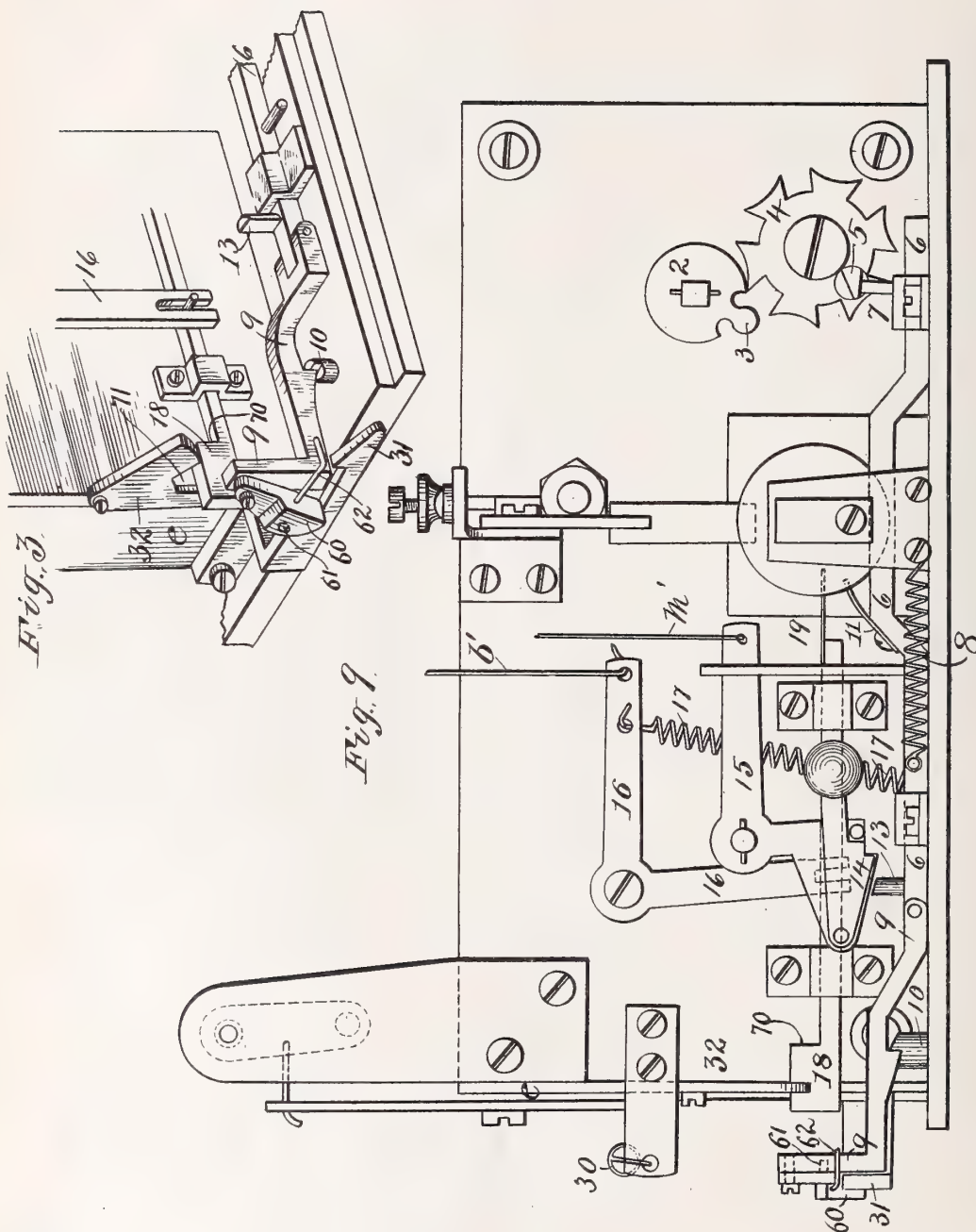
Patented Dec. 5, 1899.

L. ROSENTHAL.
PHONOGRAPH.

(Application filed Aug. 10, 1899.)

(No Model.)

7 Sheets—Sheet 3.



No. 638,674.

Patented Dec. 5, 1899.

L. ROSENTHAL.
PHONOGRAPH.

(Application filed Aug. 10, 1899.)

(No Model.)

7 Sheets—Sheet 4.

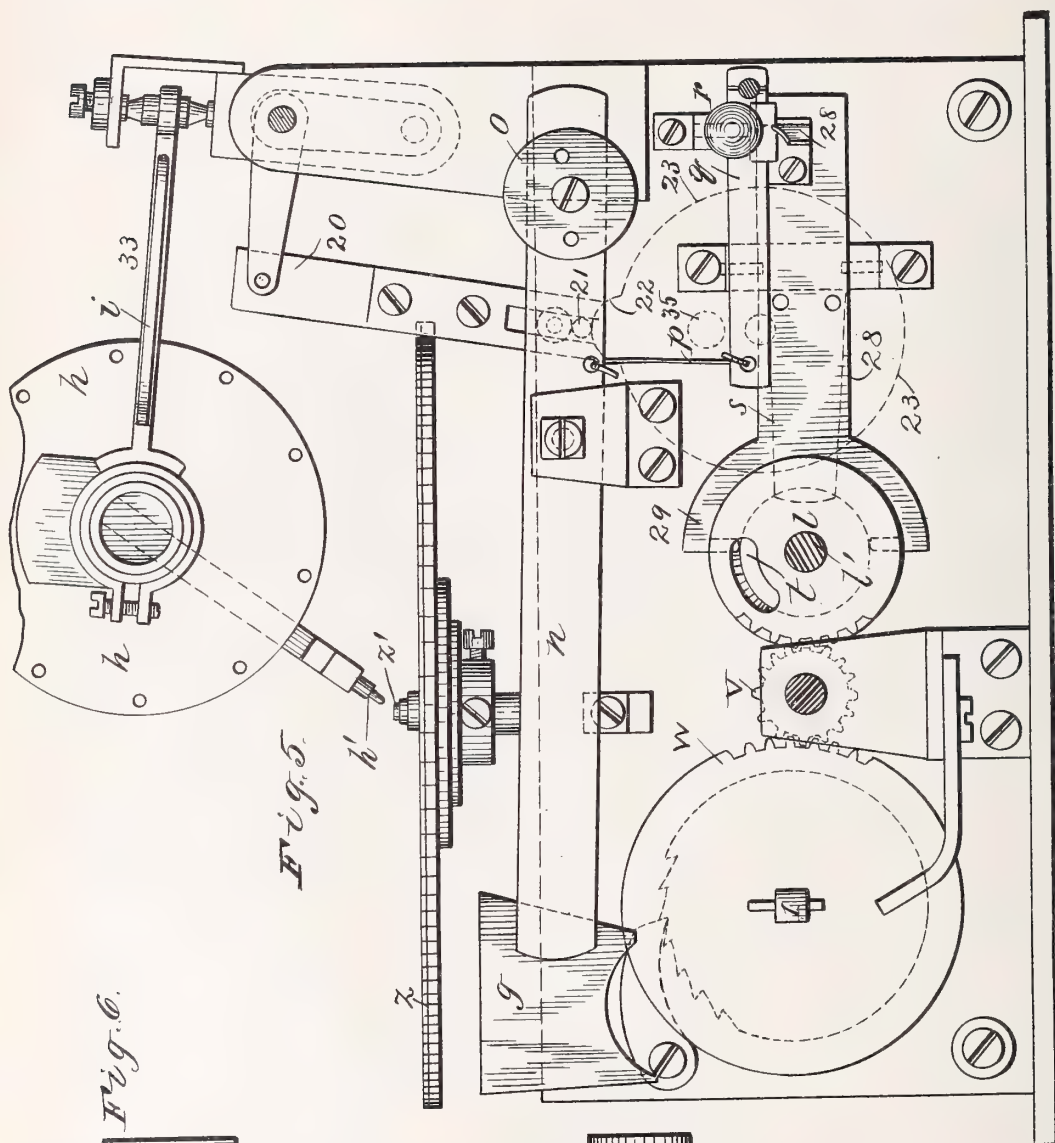


Fig. 5.

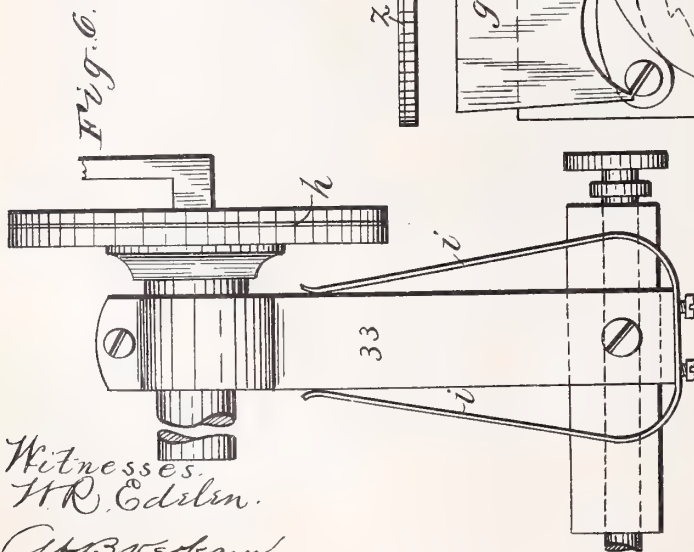


Fig. 6.

Witnesses.
H. R. Edelen.
A. B. Kerkan.

Inventor
Louis Rosenthal
by Philip Mauro
his attorney

No. 638,674.

Patented Dec. 5, 1899.

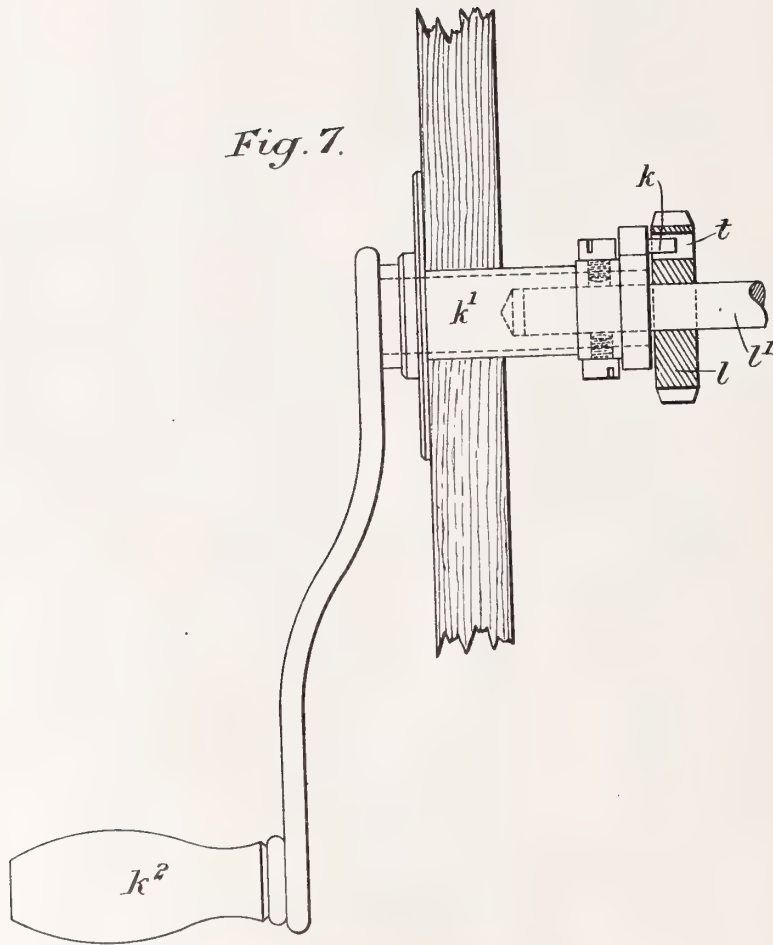
L. ROSENTHAL.
PHONOGRAPH.

(Application filed Aug. 10, 1899.)

7 Sheets—Sheet 5.

(No Model.)

Fig. 7.



Witnesses.
H. R. Edison.
[Signature]

Inventor
Louis Rosenthal
by Philip Hauro
his attorney

No. 638,674.

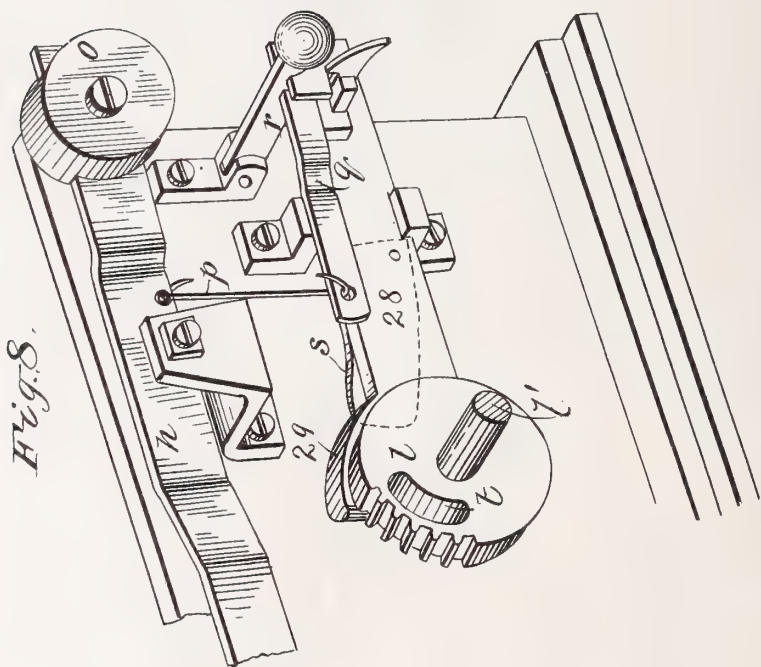
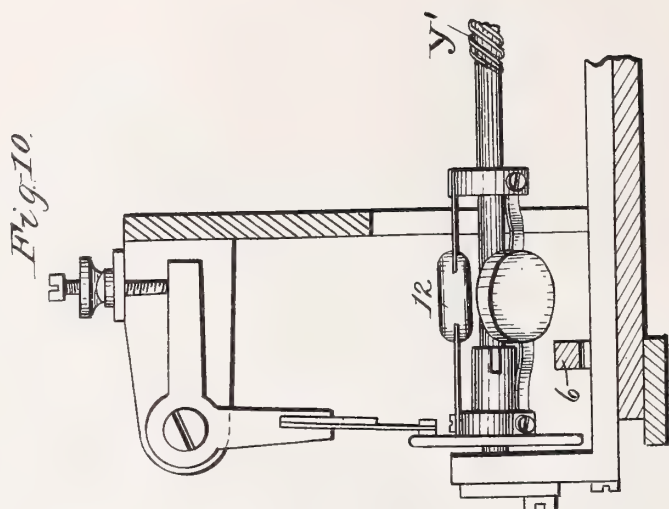
Patented Dec. 5, 1899.

L. ROSENTHAL.
PHONOGRAPH.

(Application filed Aug. 10, 1899.)

7 Sheets—Sheet 6.

(No Model.)



Witnesses.
H. R. Edison.
H. B. Kernan.

Inventor
Louis Rosenthal
by Philip Hanes
his attorney

No. 638,674.

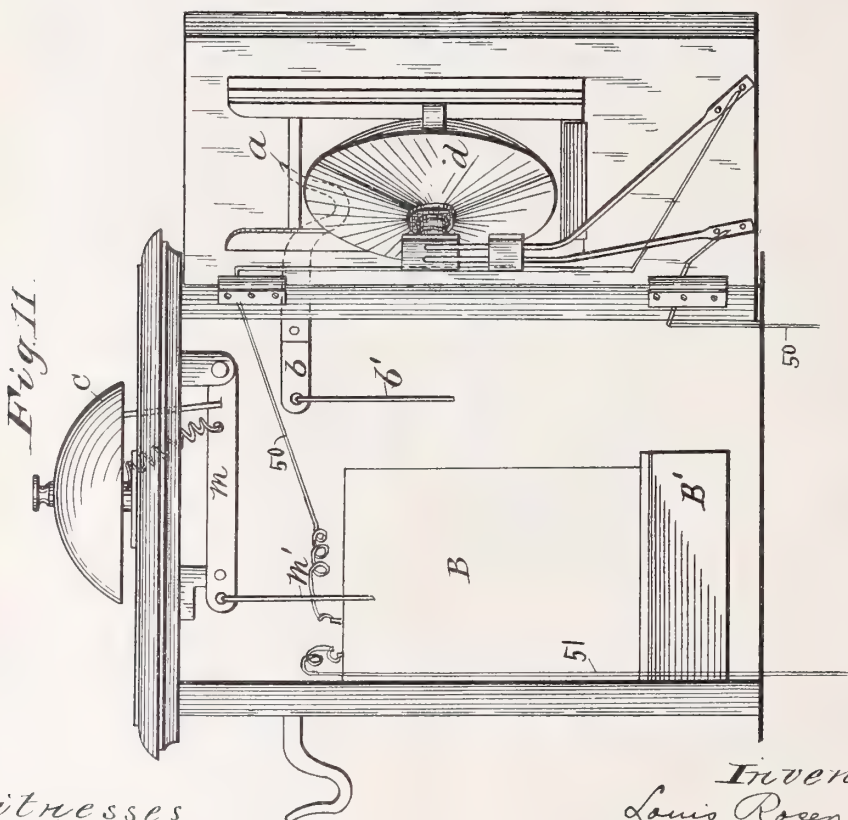
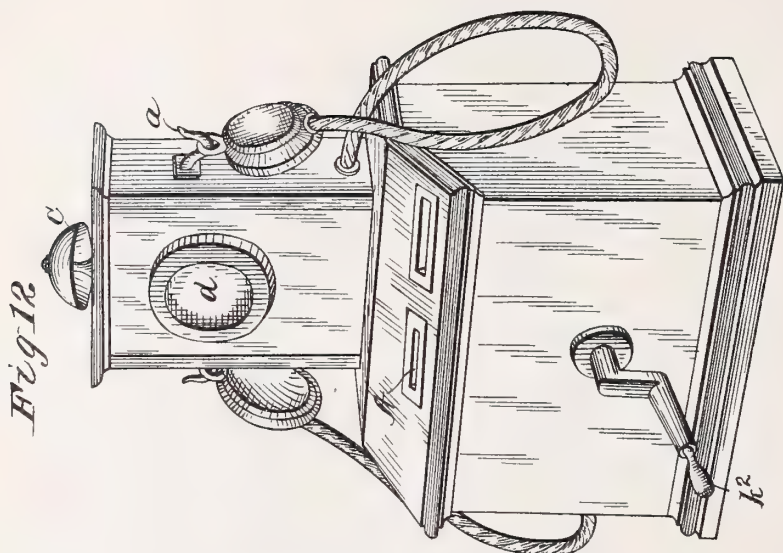
Patented Dec. 5, 1899.

L. ROSENTHAL.
PHONOGRAPH.

(Application filed Aug. 10, 1899.)

(No Model.)

7 Sheets—Sheet 7.



Witnesses
W. R. Edelman
J. H. Kerkham.

Inventor
Louis Rosenthal
by Philip Haines
his attorney

UNITED STATES PATENT OFFICE.

LOUIS ROSENTHAL, OF FRANKFORT-ON-THE-MAIN, GERMANY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 638,674, dated December 5, 1899.

Application filed August 10, 1899. Serial No. 726,759. (No model.)

To all whom it may concern:

Be it known that I, LOUIS ROSENTHAL, manufacturer, a subject of the Emperor of Germany, and a resident of 6 Ruckertstrasse, Frankfort-on-the-Main, in the German Empire, have invented certain new and useful Improvements in and Connected with Phonographs and Like Apparatus, which invention is fully set forth in the following specification.

10 This invention relates to phonographs and like apparatus, and has for one of its objects to provide means whereby on the insertion of a coin or token a crank or equivalent operating device is put into such connection with
15 the winding mechanism of a spring or other motor actuating the phonograph or the like that the said motor can be wound up. The motor is stopped by a lever mechanism which is connected with or operates a lever which
20 is depressed by the weight of the ear piece or pieces when it or they is or are suspended therefrom, thereby stopping the motor. When the ear piece or pieces is or are removed, the lever rises and releases the motor, which
25 then operates the phonograph or the like. On the spring-barrel of the motor or other suitable moving part is a projection which after the spring has been wound up separates the connection between the crank or the like and the motor, and thus prevents the apparatus
30 from being again wound up without the insertion of another coin or token. A lever or the like may be combined with the motor, by means of which lever or the like when the winding is effected a bell or other visible or
35 audible signal will be actuated to indicate that the apparatus is ready for use.

The whole apparatus when arranged for being actuated by a coin or token as aforesaid
40 may be arranged in a casing which may be similar to that of a telephonic instrument, which instrument this apparatus can be made to resemble in appearance especially if the crank or operating device and the ear piece or
45 pieces and also the signal-bell (if used) be shaped and arranged like those of a telephone, thus facilitating its use by the public.

An incandescent lamp may be arranged in the casing, which said lamp is maintained at
50 incandescence while the phonograph is actuated by the circuit of the said lamp being completed on the insertion of a coin or token.

By this means a picture having reference to the work of the phonograph or the like or an advertisement can be exhibited.

The apparatus, with its mechanism, is illustrated in the accompanying drawings, in which—

Figure 1 is a plan of the whole apparatus with the top carriage and sound-box removed. 60
Fig. 2 is a side elevation of the apparatus, showing the transporting-carriage. Fig. 3 shows in perspective the stopping mechanism employed. Fig. 4 is a side elevation of the carriage with the roller hereinafter described. 65
Fig. 5 is a front elevation of the apparatus, showing the hopper *g* for the reception of a coin and the sound-box *h*. Fig. 6 is a side elevation of the sound-box *h*, showing a spring for steadying the said box laterally. 70
Fig. 7 shows in elevation and section the driving-crank with its connecting-tappet. Fig. 8 is a perspective view showing the releasing mechanism for the toothed wheel. Fig. 9 is a rear elevation of the apparatus. Fig. 10 75
illustrates a regulator or governor employed for controlling the clockwork. Fig. 11 is an interior elevation of the upper portion of the casing with the bell or gong hammer, hook-lever for the earpiece, and the electric-lighting device. Fig. 12 is a perspective view of the complete apparatus. 80

The coin on being passed through the slot A, provided in the casing, drops into the hopper *g* on the end of one arm of a lever *n*, depressing the said arm and thereby raising the other arm, which is provided with a counterweight *o*. The lever in this movement by means of a connection *p* draws up a lever *q*, causing a bolt *r* to rise, Figs. 2, 5, and 8, and 85
release a bolt 28, which bolt under the influence of a spring *s*, Fig. 1, mounted thereon and previously kept in tension, moves a toothed wheel *l*, loose on a rod *l'*, forward by means of a fork 29 on the said bolt 28, so that 90
a tappet *k*, mounted on the crank-shaft *k'*, Fig. 7, is caused to enter a recess *t* in the said wheel *l*, which is now locked with and can be rotated by a crank-handle *k*², Figs. 7 and 12, on the said crank-shaft *k'*. The revolving toothed 95
wheel *l* drives a toothed wheel *w* by means of the intermediate toothed cylinder *v*, whereby the spring in the spring-barrel *x*, Fig. 1, is wound up, which on being released in the 100

manner hereinafter described turns, by means of the worm-gear $y y'$, the sound-plate z , and thus reproduces the sounds.

The clockwork is released in the following manner: Upon an extension of the winding-shaft 1 of the spring-barrel x a cam-disk 2, Figs. 1 and 9, is mounted, the cam 3 of which upon each revolution of the disk turns a star-wheel 4, adjacent thereto, to the extent of one tooth. As the cam 3 engages with the last tooth of the said star-wheel 4 a cam or tappet 5, mounted thereon, meets a pin 7, fast on a bolt 6, and in its movement pushes the bolt forward against the action of a coiled spring 8 in such a manner that the said bolt comes into the position represented in Fig. 9.

On the front part of the bolt 6 a catch 9 is pivotally secured, which is adapted to engage a lug 10, fixed on the base-plate of the apparatus, thereby retaining the bolt 6 in its forward position. On the bolt 6 a spring 11 is arranged, which checks the regulator 12 of the clockwork, which is released by pushing the bolt 6 forward. The spring 11 acts by engaging against and between the spring-arms of the regulator or governor, said arms carrying the weights, which fly outward by centrifugal action. On the bolt 6 is also a pin 13, which by sliding in contact with an inclined plane 14 of an angle-piece 15 causes the latter to rock on its pivot, whereby the bell-pull, Fig. 11, is put in motion by the connection m' , the sounding of which bell indicates the moment at which the user should unhook the earpiece, as the mechanism will now be in motion. If subsequently the earpiece is removed from its hook a , the weight on the lever b and line b' being thus removed, the spring 17, connected with an angle-piece 16, pulls back a bolt 18. On this bolt 18 is a spring 19, which as it slides back will on its part release the regulator 12. This spring 19 acts against and between the spring-arms of the regulator in a manner similar to spring 11.

The sound-box h , which had been previously held in an upward or raised position by a pin 21, projecting from one of a set of levers 20, bearing upon a cam 22 of a cam-disk 23, Figs. 2 and 5, is now lowered, so that its stylus h' rests upon the sound-plate z by the rotation of the cam-disk 23 and remains upon the said sound-plate until the cam-disk 23 has completed its revolution, when the pin 21 is again raised by the cam 22.

The spring-barrel x simultaneously by the aid of the gearing $x' x''$ turns the toothed cylinder 24, mounted loosely upon a shaft, and this cylinder by the aid of an intermediate toothed wheel 25 rotates a curved drum 26. This latter is so arranged as to push a sliding rod 27 against the bolt 28 (see Figs. 1, 2, 5, and 8) as soon as the mechanism is started. The bolt 28 so pushed back by means of fork 29, actuated by the same, then causes the toothed wheel l to retire in such a manner that the pin k of the crank-shaft k' , Fig. 7, becomes disengaged from the said wheel and

the crank again runs idle until by the insertion of a fresh coin the toothed wheel l can again be operated. The bolt 28 is then stopped by the aid of the swinging bolt r , the spring s being in compression, and the toothed wheel l is retained in its inoperative position.

Against the curved edge of the drum 26 a roller or pin f , Figs. 1, 2, and 4, is applied, which is mounted on a carriage e for transporting the sound-box h and which moves the carriage forward as the drum is rotated. When the carriage e has reached its outermost point, the roller f becomes free upon further rotation of the drum 26, and the carriage e and the sound-box h are returned to their original positions by the spiral spring 30. At the same time the carriage e releases the swinging catch 9, Figs. 2, 3, and 9, by the aid of a nose 31, whereupon the bolt 6 returns to the original position under the action of the spring 8 and again stops the regulator 12 and the clockwork connected therewith by means of the spring 11. The further stoppage of the mechanism is then effected in the manner already described by placing the earpiece on the hook a . In order to prevent the regulator 12, and jointly therewith the clockwork, from being stopped by the spring 19, owing to the premature hooking of the earpiece on its lever, the double lever 16 is retained during the action of the clockwork by an oscillating trap 32, Figs. 1 and 2, mounted on the framework and adapted to be released upon the return of the carriage after it has traveled its full distance forward. The trap 32 in its normal working position retains the bolt 18 by its face contacting with the shoulder 70 on the end of said bolt; but when the carriage e has completed its return journey the said carriage strikes against the edge of the trap, causing the same to rock on its pivot and bringing the opening 71 therein into a position to allow the bolt 18 to pass there-through, whereupon the regulator is locked by the spring 19. Thus it will be seen the latch is disengaged from behind the shoulder by the action of the carriage e striking against the side of the latch 32 on its return to its starting-point.

To insure a support for the sound-box h , while not impeding its lateral movements, its bracket 33 is held in position at both sides by means of a spring or springs i , Fig. 6.

The general operation of the apparatus as a whole is as follows: By the insertion of a coin into the slot A of the apparatus the lever n is rocked on its pivot, raising the lever q and bolt r , so that the bolt 28 is released and moved by the springs s , (previously in compression,) and the fork 29 on the said bolt 28 causes the toothed wheel l to engage with the crank-shaft k' . The clockwork can then be wound up. The release of the clockwork takes place after a complete revolution of the star-wheel 4 by the withdrawal of the spring 11 on the bolt 6 and the spring 19 on the bolt 18, the latter movement being effected by the

removal of the earpiece from its hook. The movement of the bolt 6 also rings the bell *c*, informing the user that the phonograph has commenced working. On the release of the regulator the shaft *Z'*, with its sound-plate *Z*, is rotated by the clockwork, the sound-box being also lowered, with its stylus, so that the latter rests on the said sound-plate by the rotation of the cam-disk 23 through gearing *x'* 25, the pin 21 dropping from the cam 22. At the same time the curved drum 26 is rotated, whereby through the rod 27 the bolt 28 is pushed back, being retained by the bolt *r*, and the toothed wheel *l* is again disengaged from the crank-shaft *K'*. The curved drum in its rotation causes, through the bolt *f*, the requisite forward movement of the carriage *e* and sound-box *h*, the return of the same being obtained by the spring 30. In this backward movement the nose 31 on the carriage *e* releases the bolt 9, so that the spring 11 again comes against the regulator and stops the clockwork. This is effected in the following manner: Catch 9 has a trip 60 pivoted thereto, Fig. 2. On the return movement of the carriage the nose 31 engages the under side of trip 60, thus lifting the catch 9, a pin 61 (shown in dotted lines, Figs. 2 and 9) acting to limit the movement of trip 60 from left to right. When the carriage is moved in the other direction, the trip 60 swings freely on its pivot, allowing the nose to pass, the bent wire 62 serving to prevent unnecessary movement in this direction.

During the working of the apparatus an electric light, Fig. 11, may be brought to incandescence, so that any suitable graphic representation, picture, or advertisement will become illuminated in front of the user. This is effected in the following manner:

The cam-disk 23, Figs. 1, 2, and 5, which is made of a good conductor of electricity, is connected with one pole of a battery *B* by a conductor 50, leading through the incandescent lamp, Fig. 11, to the frame of the machine, Fig. 2, to said disk. The other pole is connected by a conductor 51, Figs. 11 and 2, with the binding-post of a contact 34, having a part bearing against the cam-disk 23. The said disk 23 is provided at one part of its surface with an ebonite plate 35, (see Figs. 1, 2, and 5,) which comes against the contact when the mechanism and the disk are at rest. Battery *B* is supported by a bracket *B'*, Fig. 11.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a driving-motor embracing mechanism for storing up energy, means for actuating said mechanism, coin-operated devices for throwing said means into operative relation with said mechanism, sound-reproducing devices, an earpiece or receiver connected with said reproducing devices, a detent normally

preventing the operation of the motor, and a movable support for the earpiece or receiver adapted upon removal of the earpiece therefrom to withdraw said detent and release the motor, substantially as described.

2. In apparatus of the kind described, the combination with a driving-motor embracing mechanism for storing up energy, means for actuating said mechanism, coin-operated devices for throwing said means into operative relation with said mechanism, a detent normally preventing the operation of the motor, means acting to automatically withdraw said detent upon the storing up of a predetermined amount of energy, a second detent normally preventing the operation of the motor, sound-reproducing devices, an earpiece or receiver connected with said reproducing devices, a movable support for said earpiece or receiver adapted upon the removal of the latter to withdraw said second detent and release the motor.

3. In apparatus of the kind described, the combination with a driving-motor embracing mechanism for storing up energy, means for actuating said mechanism, coin-operated devices for throwing said means into operative relation with said mechanism, a signal, a detent normally preventing the operation of the motor, means acting to automatically withdraw said detent and actuate said signal upon the storing up of a predetermined amount of energy, a second detent normally preventing the operation of the motor, sound-reproducing devices, an earpiece or receiver connected with said reproducing devices, a movable support for said earpiece or receiver adapted upon the removal of the latter to withdraw said second detent and release the motor.

4. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a driving-motor embracing mechanism for storing up energy, means for actuating said mechanism, coin-operated devices for throwing said means into operative relation with said mechanism, sound-reproducing devices, an earpiece or receiver connected with said reproducing devices, a detent normally preventing the operation of the motor, a movable support for the said earpiece or receiver adapted upon removal of the latter to withdraw said detent, and means for automatically locking said detent in its withdrawn position while the machine completes a cycle of its operation.

5. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a driving-motor embracing mechanism for storing up energy, means for actuating said mechanism, coin-operated devices for throwing said means into operative relation with said mechanism, sound-reproducing mechanism embracing a carriage, means driven by the motor for advancing the same, and means for automatically returning the carriage to its starting-point upon its reaching the limit of its advance movement; an

earpiece or receiver connected with said reproducing devices, a detent normally preventing the operation of the motor, a movable support for the earpiece connected with the detent and adapted upon removal of the earpiece to withdraw the detent and release the motor, means acting automatically to lock the detent in its withdrawn position, said locking means being so located as to be acted upon by the carriage on its return movement to release the detent.

6. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a driving-motor embracing mechanism for storing up energy, means for actuating said mechanism, coin-operated devices for throwing said means into operative relation with said mechanism, sound-reproducing mechanism embracing a carriage, means driven by the motor for advancing the same, and means for automatically returning the carriage to its starting-point upon its reaching the limit of its advance movement; an earpiece or receiver connected with said reproducing devices, a detent normally preventing the operation of the motor, a movable support for the earpiece connected with the detent and adapted upon removal of the earpiece to withdraw the detent and release the motor, and means actuated by the return of the carriage to throw the mechanism for storing up energy and its actuating means out of operative relation.

7. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a motor, means for winding up the same, a spring-actuated clutch for connecting said means with the motor, coin-actuated devices or levers for releasing said clutch, sound-reproducing devices, an earpiece or receiver in communication with the same, a pivoted lever supporting and adapted to be depressed at one end by the weight of the earpiece, a spring-actuated detent connected with the other end of said lever and normally held out of engagement with the motor by the tension of its actuating-spring but adapted to be moved into engagement with and prevent the operation of the motor by the action of the supporting-lever when depressed by the earpiece.

8. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a driving-motor, of a crank for winding up the same, a spring-actuated clutch for connecting the crank with the motor, a latch for normally holding said clutch out of engagement with the crank against the tension of its actuating-spring, coin-actuated levers adapted to operate said latch to release the clutch, a detent normally in engagement with and acting to prevent the operation of the motor, a spring-actuated slide carrying said detent, means operating upon the winding up of the motor to a predetermined point to advance said slide against the tension of its spring and withdraw its detent from engage-

ment with the motor, means acting to automatically retain the slide in its advanced position, sound-reproducing devices, an earpiece or receiver in communication therewith, a movable support for said earpiece adapted to be depressed by the weight thereof, a second detent adapted to engage the motor and prevent operation thereof, connections between said detent and the movable support whereby the detent is adapted to be held in engagement with the motor while the support is depressed, and means for withdrawing the second detent from such engagement to release the motor upon the removal of the earpiece from its support.

9. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a driving-motor, of a crank for winding the same, a spring-actuated clutch for connecting the crank with the motor, a latch for normally holding said clutch out of engagement with the crank against the tension of its actuating-spring, coin-actuated levers adapted to operate said latch to release the clutch, a detent normally in engagement with and acting to prevent the operation of the motor, a spring-actuated slide carrying said detent, means operating upon the winding up of the motor to a predetermined point to advance said slide against the tension of its spring and withdraw its detent from engagement with the motor, means acting to automatically retain the slide in its advanced position, sound-reproducing devices embracing a carriage, means driven by the motor for advancing the carriage, and means for automatically returning the carriage after it reaches the limit of its advance movement, an earpiece or receiver in communication with the sound-reproducing device, a movable support for said earpiece adapted to be depressed by the weight thereof, a second detent adapted to engage the motor and prevent operation thereof, connections between said detent and the movable support whereby the detent is adapted to be held in engagement with the motor while the support is depressed, means for withdrawing the second detent from such engagement to release the motor upon the removal of the earpiece from its support, and devices actuated by the return of the carriage to move the clutch out of its operative position and into engagement with its retaining-latch.

10. In a coin-controlled graphophone or sound-reproducing apparatus, the combination with a driving-motor, of a crank for winding up the same, a spring-actuated clutch for connecting the crank with the motor, a latch for normally holding said clutch out of engagement with the crank against the tension of its actuating-spring, coin-actuated levers adapted to operate said latch to release the clutch, a detent normally in engagement with and acting to prevent the operation of the motor, a spring-actuated slide carrying said detent, means operating upon the winding up

of the motor to a predetermined point to advance said slide against the tension of its spring and withdraw its detent from engagement with the motor, means acting to automatically retain the slide in its advanced position, sound-reproducing devices, a bail acting to automatically lock the second detent in its withdrawn position, and means acting upon the return movement of the carriage to

move the clutch out of its operative position and into engagement with its retaining-latch. 10

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LOUIS ROSENTHAL.

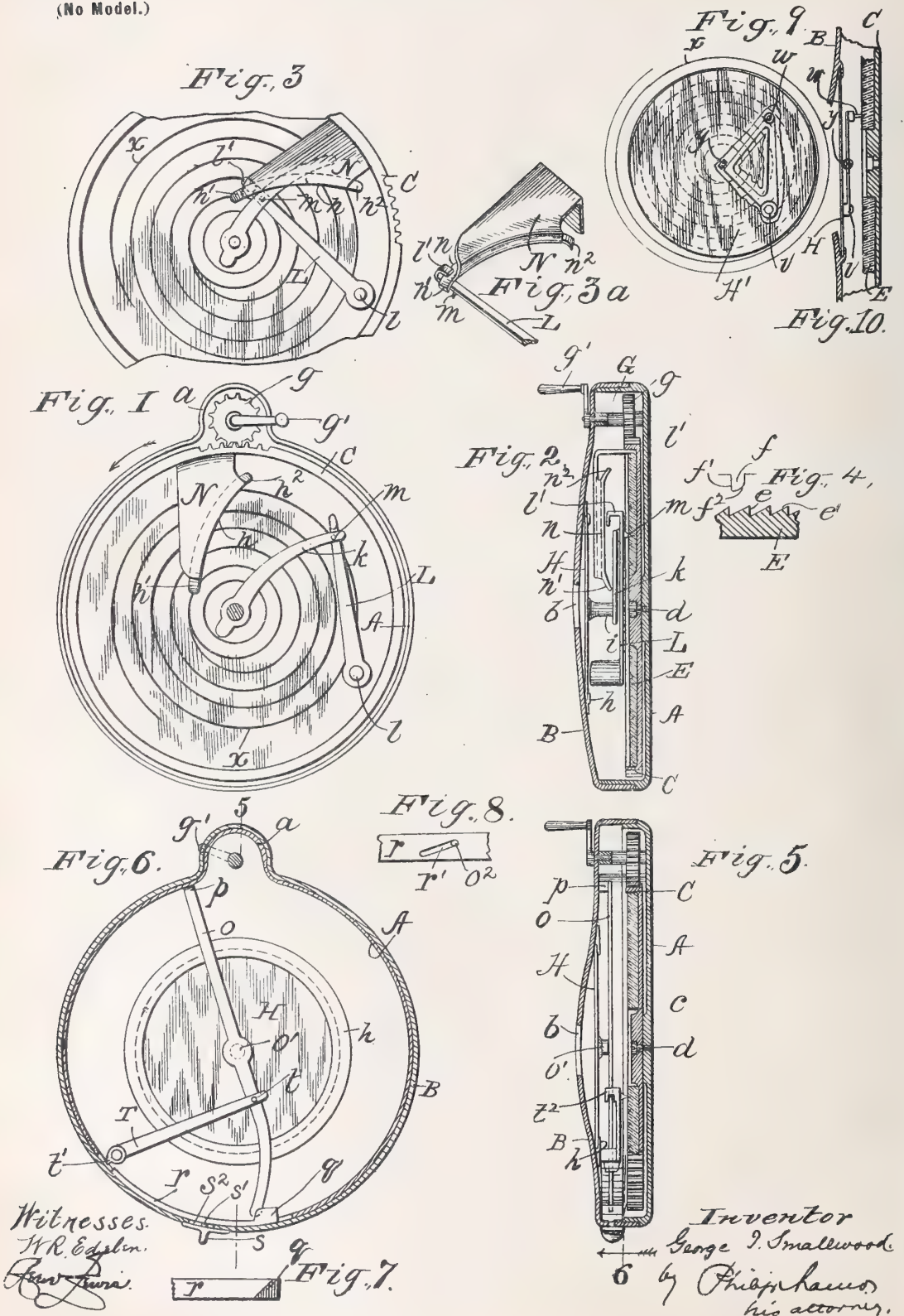
Witnesses:

GEORGE WILLIAM JOHNSON,
WILLIAM FREDERICK UPTON.

G. T. SMALLWOOD.
GRAPHOPHONE.

(Application filed June 13, 1899.)

(No Model.)



UNITED STATES PATENT OFFICE.

GEORGE T. SMALLWOOD, OF WASHINGTON, DISTRICT OF COLUMBIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 639,452, dated December 19, 1899.

Application filed June 13, 1899. Serial No. 720,425. (No model.)

To all whom it may concern.

Be it known that I, GEORGE T. SMALLWOOD, of Washington, District of Columbia, have invented a new and useful Improvement in
5 Graphophones, which improvement is fully set forth in the following specification.

This invention relates to graphophones, and comprises certain improvements hereinafter pointed out which have for their object,
10 mainly, the simplification of the mechanism for recording and reproducing sounds and the construction of efficient apparatus at small expense and in small compass.

The invention consists, first, in a stylus-
15 carrying arm having a translatory movement across the surface of the tablet independent of the diaphragm or resonant body. This construction permits of the use of a stationary diaphragm and of very light movable parts,
20 minimizing the friction and resistance in feeding. It is particularly useful where economy of space is desirable or where the instrument does not always rest on a horizontal support in use—for example, in pocket-graphophones
25 or toys of various sorts. The stylus may be either a recording or a reproducing stylus. This part of my invention also embraces means, such as a deflector, acting to lift the stylus from the record and return the same
30 to its starting-point after it has followed the record-groove for a predetermined distance or reaches the end thereof.

The invention consists, secondly, in a sound-record adapted specially for operation with
35 a reproducer mounted as just explained. Said sound-record is characterized by a groove of which one side is perpendicular (or nearly so) to the plane of the recording-surface and the other is oblique to said plane. This form of
40 groove facilitates the feeding of the recording and reproducing stylus. The groove may be formed preliminarily and the record afterward cut or engraved therein, or the groove may be cut in advance of the recording-stylus
45 by a properly-shaped tool, or records of this description may be made by molding or by any suitable process of copying or duplication. Preferably the groove is formed in the tablet before the record is made. The perpendicular
50 shoulder or face thereby effects the feeding of the recorder, and the record is cut

on the oblique face, whereby a more effective shear cut is produced.

The invention consists, further, in improvements in construction, detail, and arrangement, as may be best explained in connection
55 with the accompanying drawings, wherein—

Figure 1 is an elevation, with the front of the casing and diaphragm removed, of a pocket-graphophone embodying my invention. Fig. 2 is a sectional view of the same, partly in elevation. Fig. 3 is a detail elevation, and Fig. 3^a a detail perspective view, illustrating the position of the parts when the deflector begins its action of lifting the stylus
60 from the record in returning the same to its starting position. Fig. 4 is a detail view illustrating the shape of the record-groove and point of a recording-stylus employed therewith. Fig. 5 is a sectional view, partly in
65 elevation on line 5 of Fig. 6, of a modified form of the apparatus. Fig. 6 is a sectional view looking to the left on line 6 of Fig. 5, and Fig. 7 is a detail. Fig. 8 shows a modification of details of parts shown in Figs. 5
70 and 6. Fig. 9 is an elevation, partly broken away to show underlying parts, of another modification of the invention; and Fig. 10 is a sectional view of the same.

Referring to Figs. 1, 2, 3, 3^a, and 4, A is a casing, preferably in the shape of a shallow circular cup, having an enlargement *a* at one
80 side thereof. B is a cover therefor of corresponding shape, having a central aperture *b* therein, through which the atmosphere has
85 unrestricted access to the diaphragm.

C is a dish-shaped wheel pivotally secured to the casing by a screw *d* and having gear-teeth around its peripheral edge.

E is a record-tablet of annular disk form
90 made of any suitable material—such, for example, as wax or a wax-like material—having a sound-record formed therein in any suitable manner. The preferred form of record is, however, a groove having irregularities cor-
95 responding to sound-waves, and the preferred form of groove is that shown in Fig. 4 of the drawings, which has a wall *e* approximately perpendicular to the plane of the surface of the tablet and a wall *e'* oblique to said plane.
100 In such a groove the irregularities (elevations and depressions) corresponding to sound-

waves are formed in the inclined wall e' , while the approximately perpendicular wall e acts not only to impart to the reproducing-stylus a translatory movement across the record in the act of reproducing, but may also impart a similar movement to a recording-stylus in the act of recording sounds in such a groove.

In Fig. 4, f represents the preferred shape of recording-stylus point for use with a groove having the characteristics above mentioned. The vertical edge f' of the stylus coacts with wall e of the groove to cause the stylus to follow the latter, while the rounded edge f^2 acts to cut or engrave the record of sound in the wall e' in the form of irregularities or elevations and depressions. The record-tablet E fits closely within the dished wheel C and is rotated therewith by frictional contact.

G is a short shaft having bearings in the casing A and cover B and carrying a gear-wheel g , located in enlargement a and which meshes with the teeth of wheel C .

Shaft G may be rotated by a crank g' to drive the gear-wheel g and in turn rotate the wheel C and with it the record-tablet.

H is a diaphragm of suitable construction secured to the inside of the cover over the opening b by any suitable means, as by an annulus h , Fig. 2. To the center of the diaphragm is rigidly secured a post i , which in turn has a bar k rigidly fixed to its outer end. The bar k is preferably of arc shape, as shown in Fig. 1.

L is the stylus-carrying arm, pivoted to the under side of cover B at l , its outer end being free to swing across the record-tablet from the outer edge toward the center thereof, or vice versa, and to travel along and in close contact with the bar k .

m is the stylus-point, (which, although it, as shown in the drawings, is more particularly intended to illustrate the point of a reproducer, may obviously be the point of a recorder,) carried by the arm L . At its extremity arm L is bent in the form of a hook l' . (See Figs. 2, 3, and 3^a.)

N is a metallic deflector-plate secured at its outer edge to the wheel C and bent under at its inner edge along the line of an arc, forming a flange n , which has at its opposite extremities downwardly-turned lips n' and n^2 .

In operation, assuming that the apparatus is being used to reproduce from a tablet in which a sound-record has been formed in a groove represented by the spiral line x , Figs. 1 and 3, the stylus-point is engaged with the groove near the outer end thereof and crank g' is manipulated to rotate the record-tablet in the direction indicated by the arrow, Fig. 1.

In its movement the groove in the tablet imparts to the stylus-point and arm L a translatory movement toward the center of the record-disk, arm L swinging on its pivot l . During such movement the irregularities in the groove or record corresponding to sound-waves, impart corresponding vibratory movements to the stylus-point m , from which

they are duly transmitted to the diaphragm through the arm L and bar R . During the greater part of the travel of the stylus-carrying arm L from the outer end of the record-groove toward the center thereof the deflector-plate N passes freely over the hook l' at the extremity thereof; but when such arm nears the limit of its inward movement, as shown in Figs. 3 and 3^a, said hook l' is brought to such position that in the movement of the deflector-plate N the lip n' engages therewith and by reason of its inclination lifts the end of arm L , and with it the stylus-point m , from engagement with the record-groove x . Continued movement of the deflector-plate N causes the hook l' to travel along the flange n , the curvature of which at the same time swings the free end of arm L on its pivot away from the center of the record-tablet until the hook finally rides down the lip n^2 and is dropped gently into engagement with the record-groove near the outer end thereof. The stylus and arm carrying the same are thus automatically returned to their starting position.

In Figs. 5 and 6 I have shown a modification wherein the bar o , rigidly attached to the diaphragm through post o' , is secured at one end at p to the under side of the cover, while its other extremity is in position to be engaged by an inclined lug q on a slide k' . (See Figs. 6 and 7.) Slide k' is carried by the cover B and is adapted to be manipulated by pushing on lug s , located on the outside of the cover and connected to the slide by a pin s' , passing through a slot s^2 in the flange of the cover. T is the arm carrying stylus-point t , said arm being pivoted to the under side of cover B and having an ear t' thereon in position to be engaged by the end of slide r as the latter is moved to the left, Fig. 6.

As clearly shown in Fig. 5, the outer end of arm T is bent in the form of a hook t^2 and engages closely about (although movable along) bar o , so that the vibrations of the stylus-point are accurately transmitted to the diaphragm in the act of reproducing, (and, vice versa, in the act of recording.) When the stylus-point reaches the inner end of the record-groove, the slide r is manipulated. In the movement of the slide the inclined lug q first comes into action to lift the free end of bar o , and with it the stylus-point, from engagement with the record-tablet. After this has been effected the end of the slide comes into contact with the ear t' on arm T , swinging the latter on its pivot so that its free end is moved to the outer edge of the record-tablet, its stylus-point being, of course, still held out of contact with the tablet. Movement of the slide r to the right now lowers the stylus, so that it again makes contact with the record-tablet.

Instead of the inclined lug q on slide r I may cut an inclined slot r' therein and project the end o^2 of bar o into said slot, as clearly shown in Fig. 8.

In Figs. 9 and 10 I have shown another modification, wherein V is a triangularly-shaped frame pivoted at the point *v* of one of the angles to the diaphragm H, at the point of another angle carrying stylus-point *w*, and at the point of its third angle carrying a roller *y*, which bears against and travels over the diaphragm from the center toward the outer edge thereof as the stylus-point and frame are given a translatable movement on pivot *v* by the spiral record-groove in the tablet.

My invention is not, of course, limited to the precise construction herein shown and described, being in its broad features capable of embodiment in other forms of apparatus for recording and reproducing sound.

What I claim is—

1. In apparatus for recording and reproducing sound the combination with a stationary diaphragm or resonant body, and a record-tablet, of a stylus acting in conjunction with the record-tablet, and an arm carrying said stylus free to have a translatable movement across the surface of the tablet while in contact therewith and independently of the diaphragm and adapted to transmit between the diaphragm and stylus vibratory movements corresponding to sound-waves.

2. In a graphophone, the combination with a stationary diaphragm or resonant body, and a record-tablet, of a stylus acting in conjunction with the record-tablet, an arm carrying said stylus free to have a translatable movement across the surface of the tablet while in contact therewith, and independently of the diaphragm, and a bar rigidly secured to the diaphragm and along and in close contact with which the stylus-carrying arm travels in its translatable movement.

3. In a graphophone, the combination with a stationary diaphragm or resonant body, of a record-tablet and means for moving the same, a stylus acting in conjunction with the record-tablet, an arm carrying said stylus free to have a translatable movement across the surface of the tablet while in contact therewith and adapted to transmit between the diaphragm and stylus vibratory movements corresponding to sound-waves.

4. In a graphophone, the combination with a fixed or stationary diaphragm or resonant body, of a record-tablet and means for moving the same, a stylus acting in conjunction with the record-tablet, an arm carrying said stylus free to have a translatable movement across the surface of the tablet while in contact therewith, a bar rigidly secured to the diaphragm and along and in close contact with which the stylus-carrying arm travels in its translatable movement.

5. In a graphophone, the combination with a stationary diaphragm or resonant body, of a stylus acting in conjunction with a record-tablet, an arm carrying said stylus free to have a translatable movement across the record-tablet while in contact therewith, but independently of the diaphragm, means acting

in conjunction with the diaphragm and arm for transmitting vibratory movements corresponding to sound-waves from one to the other, and a device for returning said stylus-carrying arm to its starting position.

6. In a graphophone, the combination with a stationary diaphragm or resonant body, of a stylus acting in conjunction with a record-tablet, an arm carrying said stylus free to have a translatable movement across the record-tablet while in contact therewith, but independently of the diaphragm, means acting in conjunction with the diaphragm and arm for transmitting vibratory movements corresponding to sound-waves from one to the other, and a device acting to first lift the stylus-carrying arm to disengage the stylus from contact with the record-tablet and then to return said arm to its starting position.

7. In a graphophone, the combination with a stationary diaphragm or resonant body, of a stylus acting in conjunction with a record-tablet, an arm carrying said stylus free to have a translatable movement across the record-tablet while in contact therewith, but independently of the diaphragm, means acting in conjunction with the diaphragm and arm for transmitting vibratory movements corresponding to sound-waves from one to the other, and means acting automatically to return said stylus-carrying arm to its starting position after it has traveled a predetermined distance.

8. In a graphophone, the combination with a diaphragm or resonant body, of a stylus acting in conjunction with a record-tablet, an arm carrying said stylus free to have a translatable movement across the record-tablet while in contact therewith, but independently of the diaphragm, means acting in conjunction with the diaphragm and arm for transmitting vibratory movements corresponding to sound-waves from one to the other, and means acting automatically to first lift the stylus-carrying arm to disengage the stylus from contact with the record and then to return said arm to its starting position.

9. In a graphophone, the combination with a stationary diaphragm, of a record-tablet and means for moving the same, a stylus acting in conjunction with the record-tablet, an arm carrying said stylus free to have a translatable movement across the surface of the record-tablet independently of the diaphragm, means acting in conjunction with the diaphragm and stylus-carrying arm for transmitting vibratory movement corresponding to sound-waves between the two, and a deflector movable with the record-tablet acting automatically to lift the stylus-carrying arm to disengage the stylus from the record and to return said arm to its starting position.

10. In a graphophone the combination with a record-tablet and means for supporting and moving the same, of a fixed or stationary diaphragm, a bar attached rigidly to the diaphragm, a stylus acting in conjunction with

the record-tablet, a pivoted arm resting at its free end in close contact with and adapted to travel along the bar as the stylus is given a translatory movement over the record-tablet.

5 11. In a graphophone the combination with a disk-shaped record-tablet, and means for supporting and rotating the same, of a stationary diaphragm, arranged parallel to the flat face of the record-tablet, a stylus acting
10 in conjunction with the record-tablet, and a stylus-carrying arm free to have a translatory movement over the surface of the record-tablet while in contact therewith and between the same and the diaphragm and independently
15 of the latter, and means for transmitting vibratory movements corresponding to sound-waves between the stylus-carrying arm and diaphragm.

12. In a graphophone, the combination with
20 a stationary diaphragm, of a tablet having a record-groove therein, a stylus-carrying arm adapted to have a translatory movement across the tablet independently of the diaphragm, a stylus on said arm coacting with
25 the record-groove and imparting said translatory movement to the stylus-carrying arm, and means for transmitting vibratory movement between the stylus and stylus-carrying arm and the diaphragm irrespective of the
30 translatory movement of said stylus and arm.

13. In a graphophone, the combination with a stationary diaphragm, of a wheel or carrier, a disk-shaped record-tablet supported and movable with said carrier, of a stylus coacting with the record-tablet, an arm carrying
35 said stylus free to have a translatory movement over the record-tablet while in contact therewith and between the same and the diaphragm but independently of the latter, means

for transmitting vibratory movements between the stylus-carrying arm and the diaphragm during the translatory movement of the former, and a flat casing inclosing all of said parts.

14. In a graphophone, the combination with
45 a two-part inclosing casing, of a record-carrying gear-wheel mounted in one part, means for rotating the same, and a record-disk carried by and movable with said gear-wheel, of a stationary diaphragm mounted in the other
50 part of the casing, a stylus-carrying arm pivoted to said other part, and being free at one end to have a translatory movement over the record-disk, while in contact therewith, but independently of the diaphragm, a stylus carried
55 by the arm coacting with the record-disk, and means for transmitting between the diaphragm and stylus-carrying arm movements corresponding to sound-waves.

15. A graphophone-tablet or other solid
60 body for receiving sound-records, having therein a groove whereof one side is approximately perpendicular to the surface of the tablet and the other side oblique thereto.

16. The combination with a recording-tablet
65 having a groove whereof one face is approximately perpendicular to the surface, of a recording-stylus mounted on a freely-swinging arm, and adapted to be fed across the tablet by the engagement of said stylus
70 with said groove.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

G. T. SMALLWOOD.

Witnesses:

REEVE LEWIS,
W. B. KERKAM.

No. 640,367.

Patented Jan. 2, 1900.

G. K. CHENEY.
TALKING MACHINE.

(Application filed Mar. 3, 1899.)

(No Model.)

2 Sheets—Sheet 1.

INVENTOR
George K. Cheney
Walter Smith
ATTORNEY

No. 640,367.

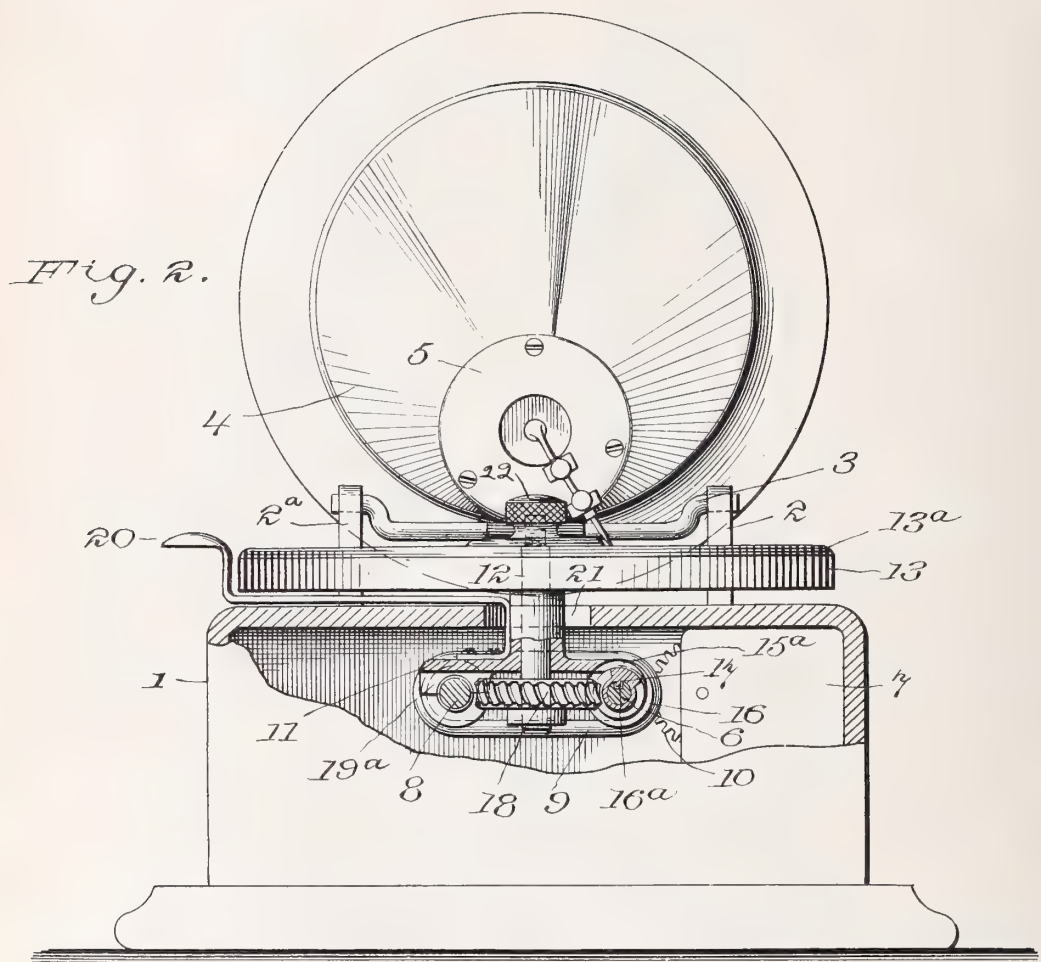
Patented Jan. 2, 1900.

G. K. CHENEY.
TALKING MACHINE.

(No Model.)

(Application filed Mar. 3, 1899.)

2 Sheets—Sheet 2



WITNESSES:

O. Platt

N. H. Humphrey

INVENTOR

George K. Cheney

BY

A. Parker Smith

ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE K. CHENEY, OF NEW YORK, N. Y.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 640,367, dated January 2, 1900.

Application filed March 3, 1899. Serial No. 707,572. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. CHENEY, a citizen of the United States of America, and a resident of New York city, county and State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

My invention relates to talking-machines in general, and is more specifically designed to produce an improved form of sound-reproducing apparatus.

The preferred construction embodying my invention is disclosed in the two accompanying sheets of drawings, in which—

Figure 1 is a plan view of the type of talking-machines known as the "gramophone" embodying my invention, and Fig. 2 is an end elevation with a part of the casing broken away.

Throughout the drawings like reference-figures refer to like parts.

Any convenient form of casing 1 incloses the driving apparatus for rotating the disk-shaped sound-record shown. To the casing are attached any convenient form of brackets 2^{2a}, on which is journaled a cross-piece 3, which carries the horn 4, on the smaller end of which is the ordinary sound-box 5, the reproducer being thereby hinged to the casing 1. Journaled in the casing 1 is the driving-shaft 6, which is driven by any suitable gearing (indicated at 10) from any convenient form of motor, whose position is indicated at 7. Parallel to the driving-shaft 6 is a feed-screw 8, and the belt 9 or other convenient form of gearing transmits motion from the driving-shaft to the feed-screw.

Hinged upon the driving-shaft and sliding endwise thereon is the record-supporting carriage 11. Journaled in this carriage is the upright shaft 12, which carries the rotating record-table 13. On this table is supported the ordinary disk-shaped record 13^a, which is held in place by the thumb-screw 22 or other convenient means. The carriage 11 is mounted on the driving-shaft 6 by means of the perforated lugs 15 15^a, through which said driving-shaft passes. Between said lugs is the worm-screw 16, also mounted on the driving-shaft and sliding endwise thereon, but compelled to rotate with said driving-shaft by

reason of the keyway 17 and the key or feather 16^a engaging therewith. This worm-screw meshes with the worm-gear 18, which is rigid on the shaft 12. The carriage 11 being hinged on the driving-shaft 6, as described, is supported on the other side by the feed-screw 8 and engages with said feed-screw by means of the half-nuts 19 19^a, which bear upon the feed-screw. The upper portion of the carriage 11 and the shaft 12 project upwardly through the top of the casing through a slot-shaped opening 21, which allows a certain freedom of movement lengthwise of the driving-shaft and feed-screw. The projection 20 is rigidly attached to the carriage 11 and extends out under and beyond the table 13, so that it can be grasped by the operator.

The mode of operation of my invention is as follows: The sound-record being fastened to the table 13, the carriage 11 is lifted up so as to free the nuts 19 19^a from engagement with the feed-screw by grasping the projection 20, and the whole apparatus is slid to the right, Fig. 1, until it reaches the position shown in dotted lines. The carriage is then allowed to fall back upon the feed-screw and the mechanism set in motion by the motor 7. The rotation of the driving-shaft 6 is transmitted through the worm-gearing to the shaft 12, and the record is thereby rotated under the sound-box 5, so that the recorded sounds are audibly reproduced. The motion of the driving-shaft is also transmitted through the belt 9 to the feed-screw 8, and the carriage 11 is thereby fed to the left, Fig. 1, at the proper rate to keep the reproducer-needle engaged with the record. When the entire record has been reproduced, the sound-box may be swung up from the record and the mechanism moved back, as before, to the position for starting over again.

It is evident that various changes could be made in the details of construction described without departing from the spirit and scope of my invention. The feed motion might be in either direction. Other forms of gearing could be employed, and the horn and sound-box might be differently mounted; but these I consider changes in form and not in principle and still within the scope of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the driving-shaft, 5 the record-carriage hinged upon the driving-shaft, the feed-screw, and means whereby the feed-screw may engage said carriage.

2. The combination of the driving-shaft, the record-carriage hinged upon the driving- 10 shaft, the feed-screw, and means whereby the feed-screw may engage said carriage, together with connecting-gearing between said driving-shaft and feed-screw.

3. The combination of the driving-shaft, 15 the record-carriage hinged to and sliding on the driving-shaft, the record-table mounted on the carriage and rotating on an axis at right angles to the driving-shaft, connecting-gearing from driving-shaft to rotating table, 20 the feed-screw parallel to the driving-shaft, and the half-nut carried by said record-carriage and adapted to engage said feed-screw.

4. The combination of the driving-shaft, the record-carriage hinged to and sliding on 25 the driving-shaft, the record-table mounted on the carriage and rotating on an axis at right angles to the driving-shaft, connecting-gearing from driving-shaft to rotating table, the feed-screw parallel to the driving-shaft, 30 and the half-nut carried by said record-carriage and adapted to engage said feed-screw,

together with the casing for the carriage and driving-gear, having a slotted opening through which the table-carrying shaft projects. 35

5. The combination of the driving-shaft, the record-carriage hinged to and sliding on the driving-shaft, the record-table mounted on the carriage and rotating on an axis at 40 right angles to the driving-shaft, connecting-gearing from driving-shaft to rotating table, the feed-screw parallel to the driving-shaft, and the half-nut carried by said record-carriage and adapted to engage said feed-screw, together with the casing for the carriage 45 and driving-gear, having a slotted opening through which the table-carrying shaft projects, and the projection from said carriage extending through said slot and under and beyond the table. 50

6. The combination of the driving-shaft, the record-carriage hinged upon the driving-shaft, the feed-screw, and means whereby the feed-screw may engage said carriage, together with the inclosing casing and the 55 sound-box hinged to said casing.

Signed by me at New York city, New York, this 25th day of February, 1899.

GEORGE K. CHENEY.

Witnesses:

LILIAN FOSTER,
A. PARKER SMITH.

Cheney 64/0/1

No. 641,578.

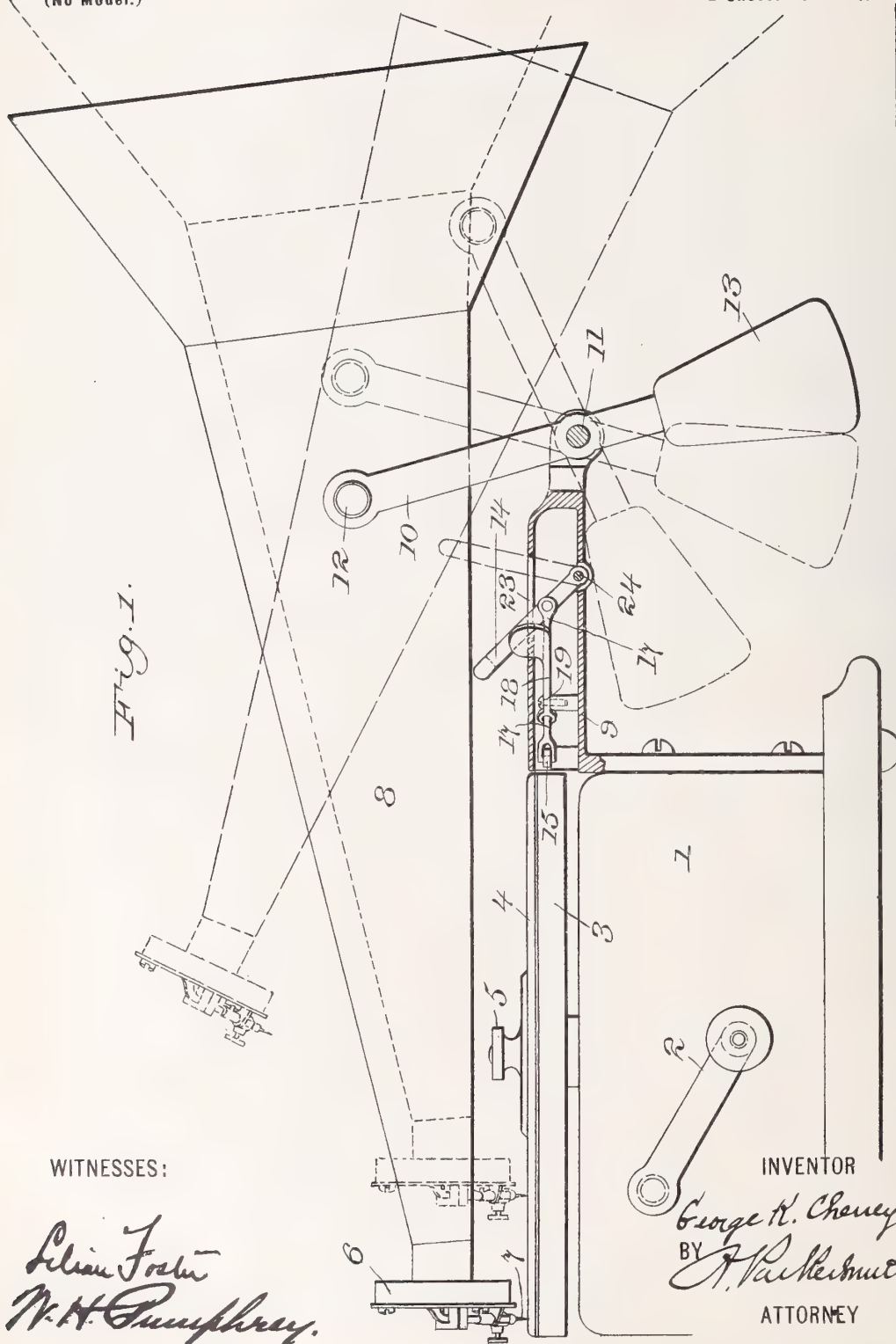
Patented Jan. 16, 1900.

G. K. CHENEY.
TALKING MACHINE.

(Application filed Apr. 29, 1899.)

2 Sheets—Sheet 1.

(No Model.)



WITNESSES:

Lillian Foster
W. H. Humphrey.

INVENTOR

George H. Cheney
BY *J. Parker Smith*
ATTORNEY

No. 641,578.

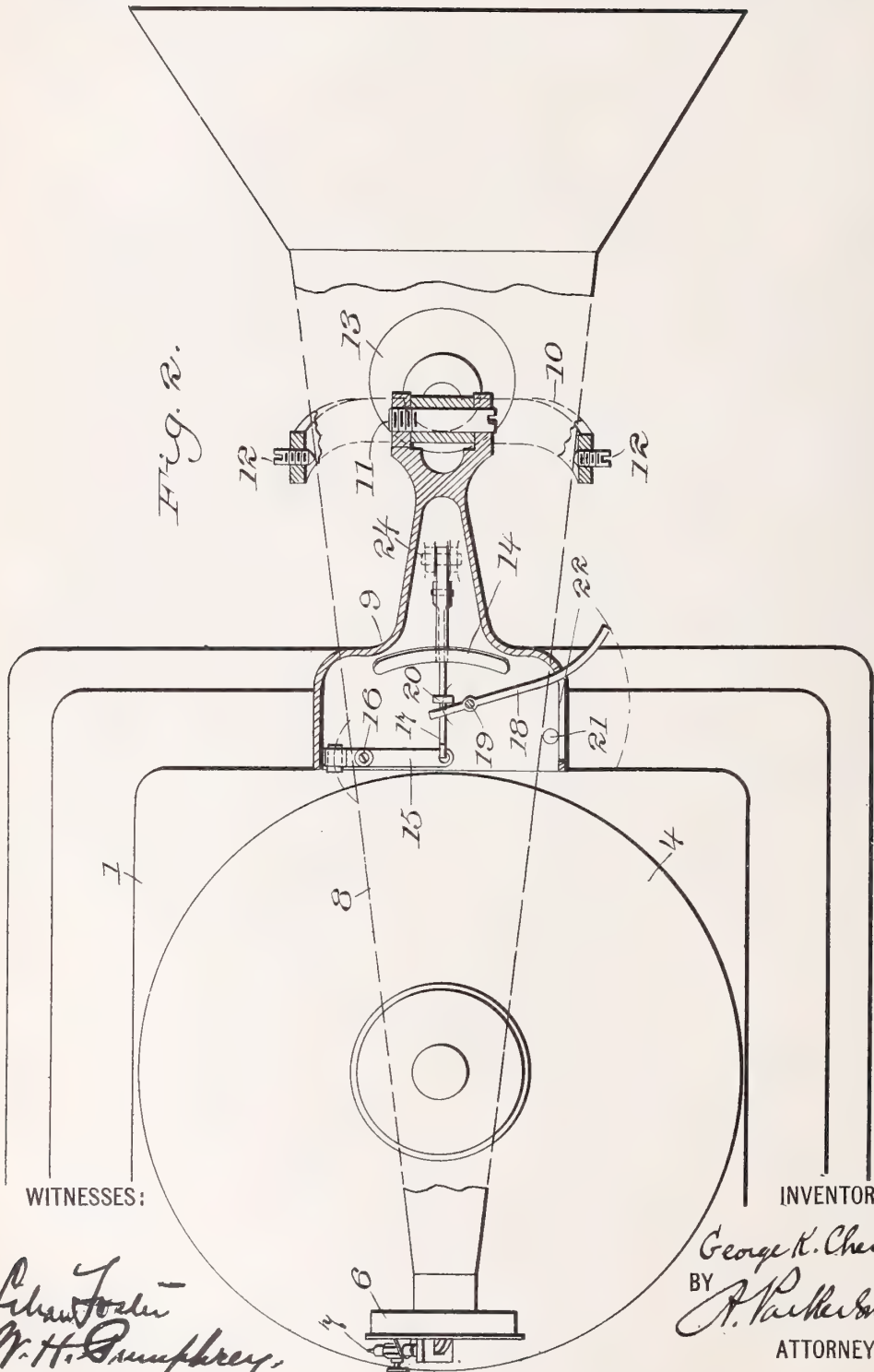
Patented Jan. 16, 1900.

G. K. CHENEY.
TALKING MACHINE.

(Application filed Apr. 29, 1899.)

(No Model.)

2 Sheets—Sheet 2.



UNITED STATES PATENT OFFICE.

GEORGE K. CHENEY, OF NEW YORK, N. Y.

TALKING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 641,578, dated January 16, 1900.

Application filed April 29, 1899. Serial No. 714,977. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. CHENEY, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Talking-Machines, of which the following is a specification.

My invention relates to talking-machines; and it consists of an improved means for mounting the reproducer and horn whereby freedom of movement for traversing the reproducer across the record is secured, together with convenient means for lifting the reproducer out of engagement with the record.

It also consists in an improved apparatus for operating the brake for the rotating record, in combination with the reproducer, so that when the brake is applied the reproducer is lifted out of engagement with the record, and vice versa.

The preferred form of apparatus embodying my invention is illustrated in the accompanying two sheets of drawings, in which—

Figure 1 is a side elevation of the gramophone with my invention applied thereto, certain parts being shown in section. Fig. 2 is a plan view of the same, with some parts broken away and others in section.

Throughout the drawings like reference-figures refer to like parts.

The gramophone-base 1 contains any ordinary form of motor, (not shown,) which is wound up by the crank 2. This motor rotates a horizontal table 3, on which is carried the sound-record 4, having sound-waves represented in the undulations of a spiral groove therein. The sound-record is held to the table in any convenient manner, as by the thumb-screw 5. The sound-reproducer 6, having the stylus 7, engaging with the grooves in the sound-record, is carried by the horn 8.

The casing 1 has a hollow casting 9 fixed to one side, upon the outer end of which is hinged the swinging frame 10 by means of the shaft 11 or equivalent construction. The horn 8 is hinged to the upper end of the swinging frame 10, as by the pointed screws 12 12. To this swinging or hinged supporting-frame is preferably attached the counterweight 13, the center of gravity of the whole apparatus being slightly below 11, the pivotal point of attach-

ment to the main frame or casting 9. A swinging rest 14 for the reproducer is pivoted to the main frame at 24 and provided with a curved or forked upper portion adapted to engage with the under side of the horn 8 and swing said horn up in the position of broken lines shown in Fig. 1.

A brake-lever 15 is pivoted to the main frame at 16 and has its other end connected to the swinging rest 14 by the link 17, so that the brake-lever and rest move simultaneously. A small lever 18 is pivoted to the main frame at 19 and slides loosely on the link 17 until it strikes the lug or collar 20 on said link.

A stop 21 for the lever 18 is placed at the proper position on the casting 9. The lever 18 projects through the slot 22 in the casting 9, so that its outer end can be seized by the thumb and forefinger of the operator. The swinging rest 14 projects up through the slot 23 in the top of the casting 9.

The method of operating my invention is as follows: The parts being as shown in full line in Fig. 1, the table 3 will rotate under the action of the motor. The axes 11 12 of the hinged support for the reproducer being parallel to the line of travel of the sound-record at the point of its contact with the reproducing-stylus 7 the supporting apparatus will present a rigid resistance against movement in that direction, so that the reproducer will remain practically stationary while the sound-record 4 travels under the reproducer-stylus 7 and impresses the sound-vibrations upon the diaphragm in said reproducer. The hinged supporting apparatus, however, is perfectly free to yield from left to right, (looking at Fig. 1,) so that the apparatus will be fed over by the action of the sound-record into the position shown in dotted lines in Fig. 1 and the entire record reproduced. The counterweight 13 normally tends to hold the swinging support 10 in a vertical position, so that the weight of the horn is approximately counterbalanced in whatever position it is. Thus little or no resistance is presented to the feeding action of the sound-record. When the operator wishes to stop the machine, he throws the brake-lever 18 over against the stop 21, thereby throwing on the brake and at the same time forcing the pivoted rest 14 up into the position shown in broken lines in Fig. 1. This

lifts the horn and reproducer into the broken-line position in Fig. 1. In starting the machine into operation again the operator takes hold of the horn 8 and replaces it in the full-line position. This places the stylus at the beginning of the record and automatically takes off the brake and leaves the machine free to operate.

The advantages of my invention consist in its cheapness and simplicity, in the doing away with all sliding friction and substituting pivot friction therefor, in the positive action of the rest in holding the horn and reproducer lifted above the record, so that the reproducer-stylus is not liable to be violently driven down upon the record, and in the automatic action of the brake in connection with the throwing of the reproducer into and out of engagement with the sound-record.

It is evident, of course, that various changes could be made in the details of construction illustrated without departing from the spirit and scope of my invention, so long as the relative arrangement of parts shown in the drawings or the principle of operation disclosed in the specification is preserved. Other forms of brake, swinging rest, and connecting mechanism might be substituted, springs might take the place of weight, and certain features of the invention might be applied to other forms of talking-machines than the particular form illustrated and known as the "gramophone;" but all these changes I consider matters of form and not of substance, and the resulting apparatus I should still regard as being within the scope of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the main frame, the rotating sound-record, the reproducer coöperating therewith, the supporting-frame hinged to the main frame and to the reproducer, the axes of both hinges being substantially parallel to the line of travel of the sound-record at the point of its contact with the reproducer-stylus, and the rest for said reproducer also hinged to the main frame.

2. The combination of the main frame, the rotating sound-record, the reproducer coöperating therewith and the supporting-frame hinged to the main frame and to the reproducer, the axes of both hinges being substantially parallel to the line of travel of the sound-

record at the point of its contact with the reproducer-stylus.

3. The combination of the main frame, the rotating sound-record, the reproducer coöperating therewith, and the supporting-frame hinged to the main frame and to the reproducer, the axes of both hinges being substantially parallel to the line of travel of the sound-record at the point of its contact with the reproducer-stylus, together with the counterweight suspended from the hinged frame below its pivotal point of attachment to the main frame.

4. The combination of the main frame, the rotating sound-record, the reproducer coöperating therewith, and the hinged support on the main frame for said reproducer, the axis of the hinge being substantially parallel to the line of travel of the sound-record at the point of its contact with the reproducer-stylus, together with the rest for said reproducer also hinged to the main frame, the axis of its hinge being substantially parallel to that of the hinged support.

5. The combination of the main frame, the rotating sound-record, the reproducer coöperating therewith, and the hinged support on the main frame for said reproducer, the axis of the hinge being substantially parallel to the line of travel of the sound-record at the point of its contact with the reproducer-stylus, together with the rest for said reproducer also hinged to the main frame, the brake for the rotating record, and connecting mechanism between said brake and the hinged rest.

6. The combination of the main frame, the rotating sound-record, the reproducer coöperating therewith, and the hinged support on the main frame for said reproducer, the axis of the hinge being substantially parallel to the line of travel of the sound-record at the point of its contact with the reproducer-stylus, together with the rest for said reproducer also hinged to the main frame, the brake for the rotating record, and connecting mechanism between said brake and the hinged rest, and the lever for simultaneously operating said brake and hinged rest.

Signed by me at New York city, New York, this 27th day of April, 1899.

GEORGE K. CHIENEY.

Witnesses:

LILIAN FOSTER,
A. PARKER-SMITH.

No. 643,183.

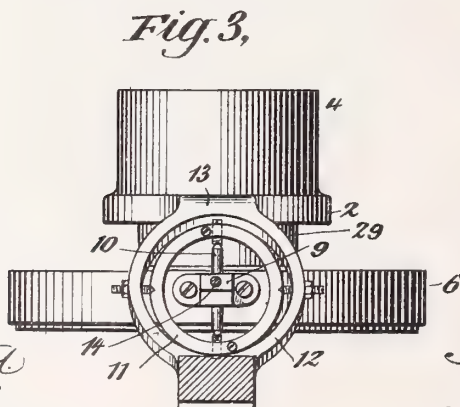
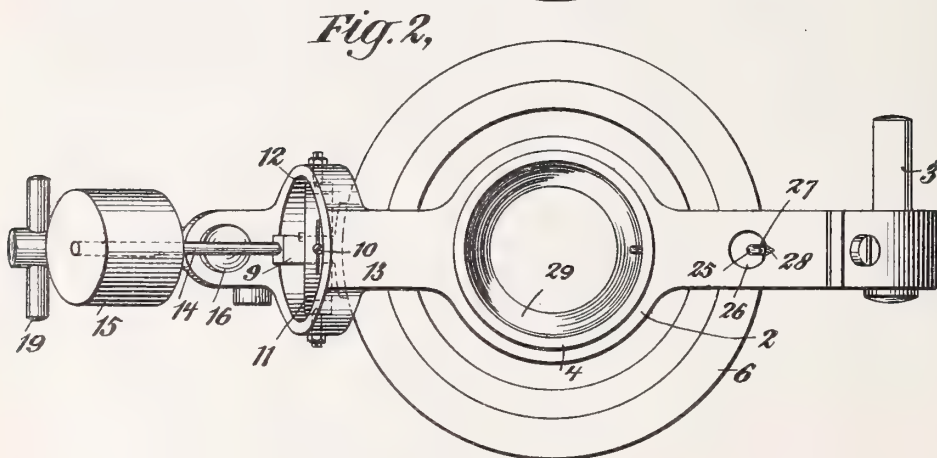
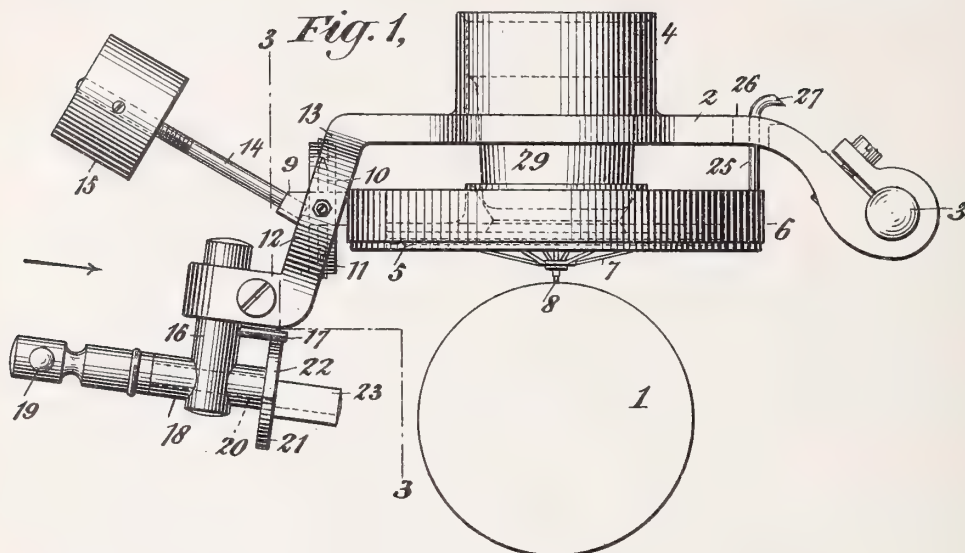
Patented Feb. 13, 1900.

G. BETTINI.
PHONOGRAPH.

(Application filed May 1, 1897.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

D. H. Haywood
Ernest Hopkinson

INVENTOR

Gianni Bettini

BY
E. N. Dickerson
his ATTORNEY

No. 643,183.

Patented Feb. 13, 1900.

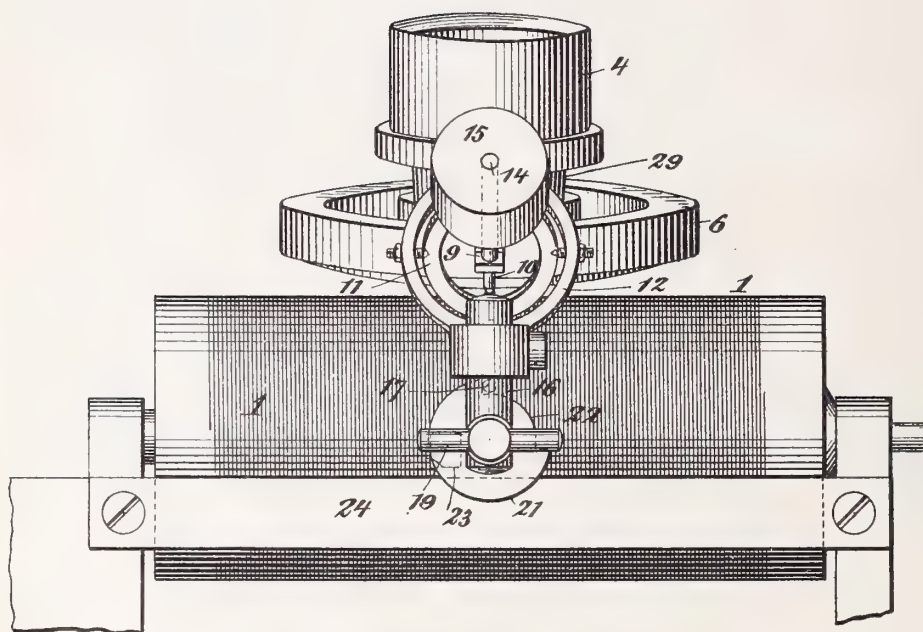
G. BETTINI.
PHONOGRAPH.

(Application filed May 1, 1897.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 4,



WITNESSES:

W. H. Haywood
Emmett Hopkinson

INVENTOR

Gianni Bettini

BY

E. N. Dickerson
his ATTORNEY

UNITED STATES PATENT OFFICE.

GIANNI BETTINI, OF NEW YORK, N. Y.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 643,183, dated February 13, 1900.

Application filed May 1, 1897. Serial No. 634,672. (No model.)

To all whom it may concern:

Be it known that I, GIANNI BETTINI, of the city, county, and State of New York, have invented new and useful Improvements in Phonographs, of which the following is a specification.

The present invention relates to phonographs and contemplates new and improved means for raising and lowering the parts supporting the diaphragm and stylus into and out of operating position.

In the drawings I have illustrated a construction embodying my invention, in which—

Figure 1 is an elevation view. Fig. 2 is a plan view. Fig. 3 is a sectional view along line 3 3 of Fig. 1, and Fig. 4 is an elevation view looking in the direction of the arrow of Fig. 1 and showing the parts associated with the record-cylinder.

In the several views of the drawings like symbols of reference refer to like parts.

Referring to the drawings in detail, 1 represents the record-cylinder.

2 designates the frame upon which is supported the diaphragm-carrying parts. This frame is supported by a rod 3, properly attached to and operated by the phonograph mechanism, so as to be moved lengthwise of the record-cylinder at a rate proportionate to the rate of rotation of said cylinder. Formed integral with the frame 2 is an upstanding tubular mouthpiece 4, adapted to receive a sound-conduit.

The diaphragm 5 is carried in an annular frame 6, said diaphragm being provided with a spider 7, carrying a stylus-point 8 in contact with the record-surface 1. The frame 6 is supported upon the frame 2 so as to have a universal motion relatively thereto and to the record-surface. Projecting from the annular frame 6 is a stud 9, secured to a vertical pin 10, journaled in a ring 11, which ring is in turn journaled by horizontal journal-points to an outer ring 12, formed on a depending arm 13 on the frame 2, these parts constituting a gimbal connection between the annular frame 6, carrying the diaphragm, and the frame 2. The threaded rod 14 is secured to the stud 9, on the end of which is screwed a counterweight 15, by means of which the frame 6 and the diaphragm carried thereby are delicately counterbalanced in order that

the stylus may bear a proper relationship to the record-surface. Secured to the arm 13 is a stud 16, having a pin 17 projecting toward the record-surface in the path of an oscillating disk provided with stops, said pin limiting the movement of the disk in opposite directions. Through the lower end of the stud 16 passes a sleeve 18.

19 designates a finger-piece, formed integral with or secured to which is a shaft 20, which carries on the opposite end a disk 21, having a cut-out portion 22 extending approximately through a quarter of its circumference. Into this cut-out portion projects the pin 17, before described. On the disk 21 is a lug 23, which normally has a position out of contact with the rest 24; but when turned by the finger-piece it comes in contact with said rest, thus lifting the frame 2 and the annular frame 6, carrying the diaphragm, and raising the stylus out of contact with the record-surface.

25 designates a guide-stem which is secured to the frame 6 at a point diametrically opposite the pivotal point thereof and passes up through an opening 26 in the frame 2. This guide-stem 25 is provided with a portion 27 at right angles thereto, said portion 27 being V-shaped on its under side and adapted to fit a correspondingly-shaped cut-out portion or groove 28 in the wall of the opening 26, the apex of the groove or cut-out portion being on an imaginary line passing through the center of the diaphragm and the center of its pivotal point in the gimbal. When the frame 6 is raised so as to elevate the diaphragm out of contacting position with the record-surface, the V-shaped portion of the stem 25 comes to rest in the groove 28, thus insuring the stylus having a central position, so that it will naturally fall in the record-groove when the frame 6 is again lowered to its operating position.

29 designates a throat-piece whose function is to direct the sound-waves from the sound-conduit to and from the diaphragm.

What I claim as new is—

1. The combination of a frame, a diaphragm supported thereon so as to permit of automatic vertical and lateral motion of said diaphragm, a disk provided with stops, a pin against which said stops abut, a lug eccen-

trically carried on said disk and contacting with a fixed portion of the frame and means for moving said lug to raise and lower said frame, substantially as specified.

5 2. The combination of a frame, a diaphragm supported thereon so as to permit of automatic vertical and lateral motion of said diaphragm, a disk provided with stops, a pin
10 against which said stops abut, a lug eccentrically carried on said disk, means for moving said lug to raise and lower said frame, and means for guiding the diaphragm in its movement into and out of operating position, substantially as specified.

15 3. The combination of a frame, a diaphragm supported thereon so as to permit of vertical

and lateral motion, a support for said diaphragm and a guide-stem projecting through an opening in said frame, a V-shaped portion of said stem, and a correspondingly-shaped 20 portion formed in the wall of the opening through which said stem projects and in which the V-shaped portion of the stem is adapted to be seated, substantially as specified.

In testimony whereof I have signed my 25 name to this specification in the presence of two subscribing witnesses.

G. BETTINI.

Witnesses:

ERNEST HOPKINSON,
S. ROBERTS.

No. 643,418.

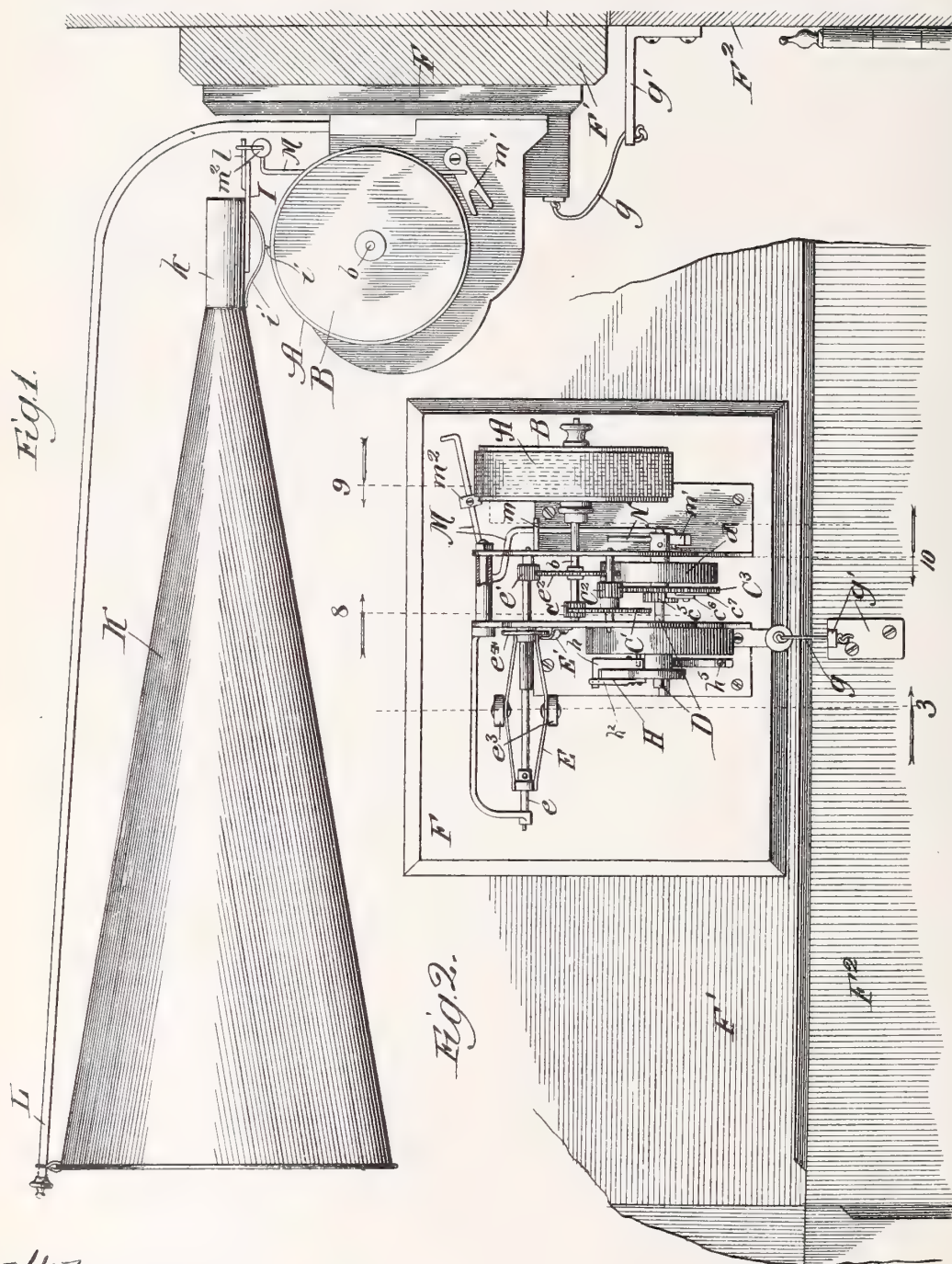
T. B. LAMBERT.
PHONOGRAPH.

Patented Feb. 13, 1900.

(Application filed May 8, 1899.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:
E. C. Gaylord,
L. S. Feltner

Inventor:
Thomas B. Lambert,
By Manning P. Manning, Shoridan,
Attys.

No. 643,418.

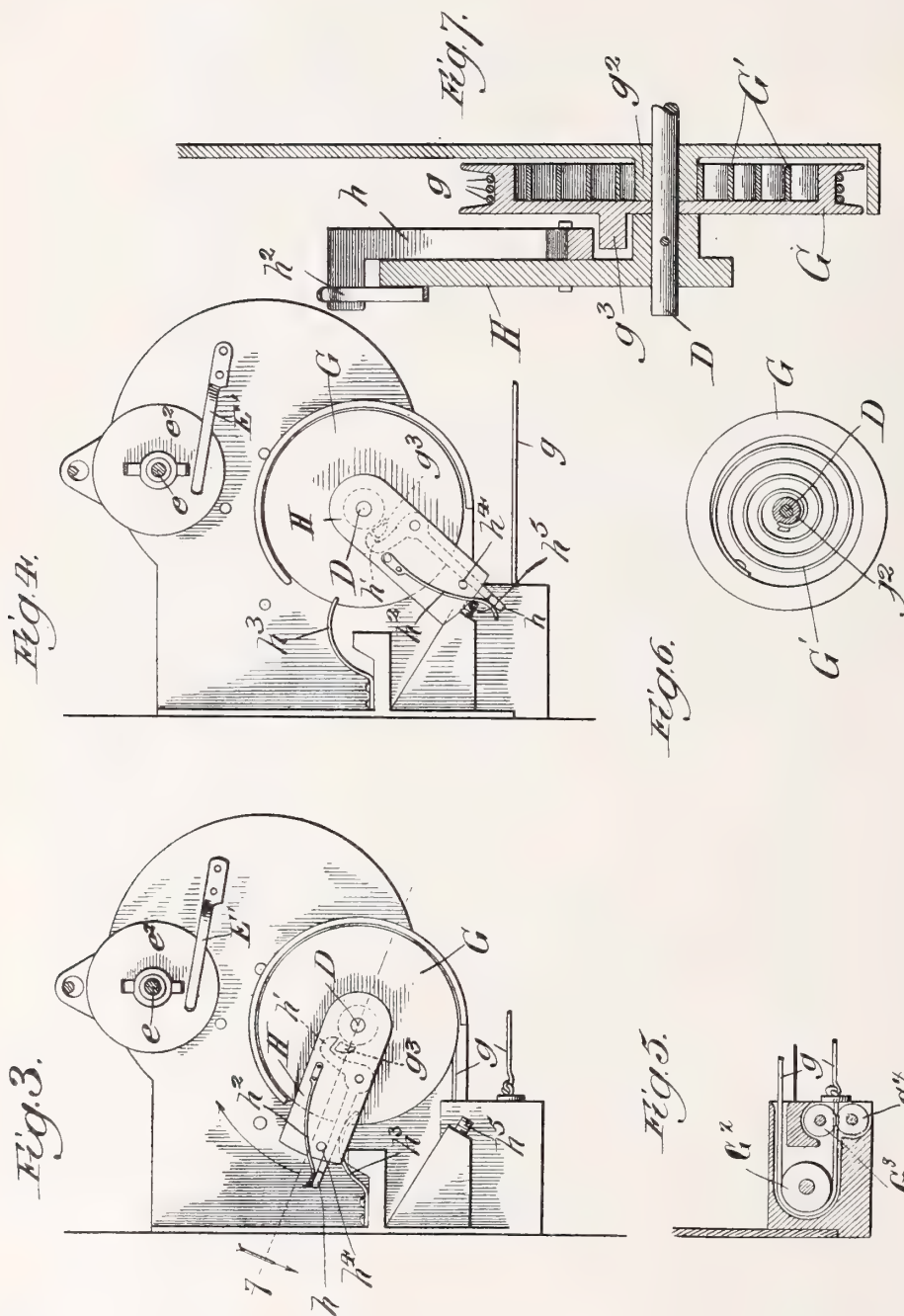
Patented Feb. 13, 1900.

T. B. LAMBERT.
PHONOGRAPH.

(Application filed May 8, 1899.)

(No Model.)

3 Sheets—Sheet 2.



Witnesses:
C. S. Gaylord,
J. S. S. S.

Inventor:
Thomas B. Lambert,
By Dunning & Dunning, Solicitors,
ATTY. IN L.

No. 643,418.

Patented Feb. 13, 1900.

T. B. LAMBERT.
PHONOGRAPH.

(Application filed May 8, 1899.)

(No Model.)

3 Sheets—Sheet 3.

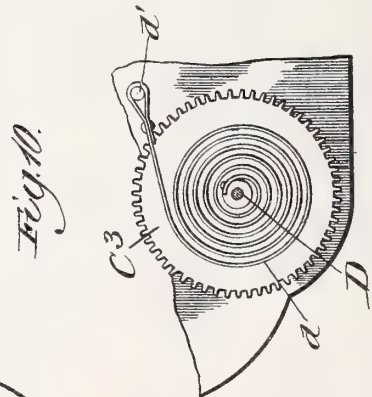
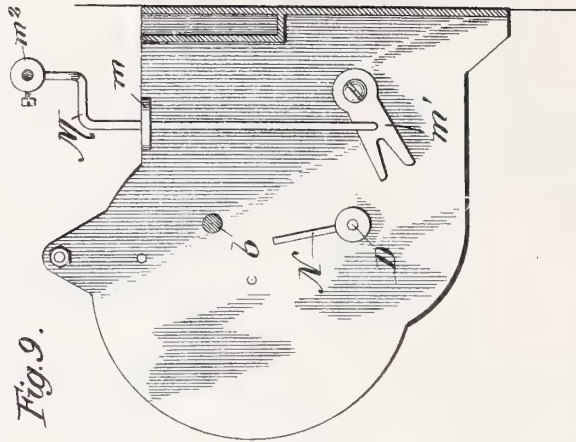
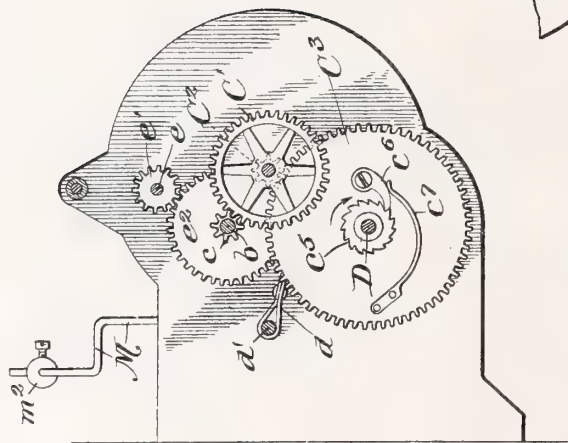


Fig. 8.



Witnesses:
E. C. Gaylord,
L. S. J. J.

Inventor:
Thomas B. Lambert,
By Dunning & Dunning, Attorneys.

UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO BRIAN F. PHILPOT, HENRY J. COSGROVE, ORSON C. WELLS, ROBERT PRINGLE, AND ALBERT D. PHILPOT, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 643,418, dated February 13, 1900.

Application filed May 8, 1899. Serial No. 715,964. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

My invention relates particularly to that class of phonographs arranged to be operated automatically, and especially to the means by which the operating mechanism is energized, all of which will more fully hereinafter appear.

The principal object of my invention is to provide a phonograph with simple, economical, and efficient mechanism for operating it automatically and for predetermined lengths of time; and the invention consists in the features, combinations, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation of a phonograph constructed in accordance with my improvements and arranged to have its mechanism energized by the opening of a door. Fig. 2 is a front elevation of the same with the horn and case removed. Fig. 3 is an enlarged side elevation of the mechanism, partly in section and taken on the line 3 of Fig. 2, looking in the direction of the arrow; Fig. 4, a similar view showing the mechanism as it appears when energized; Fig. 5, an enlarged sectional detail; Fig. 6, a side elevation of the spring and its barrel, which are shown in sectional view in Fig. 7, looking at it from the inside; Fig. 7, an enlarged sectional view taken on the line 7 of Fig. 3. Figs. 8 and 9, respectively, are vertical sectional elevations taken on the lines 8 and 9 of Fig. 2; and Fig. 10, a sectional detail showing the mainspring, taken on the line 10 of Fig. 2, looking in the direction of the arrow.

It is well known in the art to which this invention relates that it is quite common and customary to run the record-cylinders of phonographs by motors of all kinds, and particularly with spring-motors which run for a given length of time and which when the energy stored therein is exhausted cease to op-

erate the mechanism. It is desirable in this art, however, to use this class of phonographs for the purpose of advertising or uttering some well-known phrase, song, or piece of music repeatedly and to construct and arrange the mechanism in such a manner that the opening or closing of a door, pulling out of a handle, or other means will serve to energize the motor automatically and cause the parts to operate.

My invention, therefore, is designed, primarily, to provide a phonograph with actuating or automatically-operating mechanism so arranged and constructed that it can be wound up or energized by the opening or closing of a door, so as to cause the record-cylinder to operate and utter any phrase, piece of music, or advertisement that it is desirable to use, all of which will more fully hereinafter appear.

In constructing a phonograph in accordance with my improvements I provide a record-cylinder A of the desired size and shape and arranged to be supported on a drum B, which is formed of two flanged heads or disks mounted upon a shaft *b*. This shaft is arranged to be rotated by the train of gears and pinions C, C', C², and C³, the last of which is loosely mounted upon a shaft D, to which shaft is secured one end of a spiral spring *d*, resembling the mainspring of a clock, the other end of which is secured to the frame of the machine at *d'*. The parts are so constructed and arranged that when the spring is at liberty to work or is wound up the train of gears and pinions are operated and the record caused to rotate.

To regulate the speed at which the train of gears operates, a centrifugal governor E is provided mounted upon a shaft *e*, which by means of the pinion *e'* engages with a gear *e*² on the record-shaft, so that when such shaft is rotating the centrifugal governor is operated to throw its weights *e*³ over from the center and as a consequence draw the disk *e*⁴ outwardly against the frictional tension of the spring E', all of which serves to regulate the speed at which the train of gears operates.

As shown in Fig. 1, the phonograph is mount-

ed upon a base F, which in turn is secured to a frame F' above, say, a door F². It is desirable to arrange the mechanism in such manner that when the door is opened the main-
 5 spring *d* will be wound up and the mechanism caused to operate. In order to accomplish this result, a sheave-pulley G is provided and loosely mounted around the main-spring-shaft. This pulley is connected with
 10 the door by means of a cord *g*, which is wound around the pulley and passed between the idlers G², G³, and G⁴ and which is connected to the bracket *g'* on the door, as appears in Figs. 1 and 2. The sheave-pulley is hollowed
 15 out on the inside, so as to receive a spiral spring G', which is secured thereto and to a boss *g*² on the frame of the machine, so that the movement of the door in opening acts to wind up the spring and produce a resistance
 20 that will, with the releasing or closing of the door, cause a reverse action on the sheave-pulley through the recoil of the spring and rotate such pulley backward and rewind the cord thereon. I prefer to use a coiled spring
 25 for this purpose rather than a weight, because the spring responds more promptly, keeping the cord taut and free from entanglement with the door when rapidly closed.

To impart the rotations of the sheave-pulley to the mainspring-shaft for the purpose of winding the same, the mainspring-shaft is provided with a lever-arm H, having a dog *h* pivotally mounted thereon, so that the latch
 30 portion *h'* may be contacted by a lug *g*³ on the sheave-pulley. When the parts are in the position shown in Fig. 3, a spring *h*³, arranged on the frame or other fixed part of the machine, serves to keep the dog in position
 35 against the tendency of a second or emergency releasing-spring *h*² until the dog is contacted by a lug *g*³ on the sheave-pulley, which position is regulated by means of the pin *h*⁴. When the sheave-pulley starts to rotate,
 40 the lug *g*³ contacts the hook of the dog and by means of its engaging friction carries the dog, lever-arm, and mainspring-shaft around until the parts reach the position
 45 shown in Fig. 4, so that the end of the dog is contacted by the stop-screw *h*⁵, the engaging friction overcome, and the dog pushed over
 50 as the sheave continues to rotate until the latch is disengaged from the lug thereon. This point is reached when the mainspring is completely wound up or wound up sufficiently
 55 to cause the record to operate the desired or predetermined length of time. If the door is opened farther, it will be seen that the sheave-pulley is rotated without in any way
 60 injuring the mechanism or causing the mainspring to be wound too tight. The spring *h*³ also holds the latch *h'* in position to be engaged by the lug *g*³ with the forward travel
 65 of the sheave-pulley, as without such spring the tendency of the engagement would be to throw the dog down and carry the latch out of the path of travel of the lug.

From an inspection of Figs. 3 and 4 it will be seen that if the door is opened only partially and then quickly closed before it completely winds the spring, so as to cause it to
 70 contact or impinge against the stop-screw, the second or emergency releasing-spring *h*² will force the dog from and out of contact with the lug on the sheave-pulley, and thereby permit the independent opening and closing
 75 of the door without winding the spring to its limit and as required to bring the parts into the proper relation hereinafter described for operating the horn and diaphragm, which, as will be seen, provides safety mechanism, so
 80 that the phonograph will perform its operations entirely or not at all, and also permits the cord to be retained in a taut condition and prevented from being caught by the closing door. The engagement between the lug
 85 and latch from the starting-point until the pin *h*⁵ is reached will be maintained so long as a steady pull of the cord on the pulley is continued. Any release of the pull, however,
 90 will permit the cord to slack, when the spring *h*² at once acts and breaks the engagement between the lug and the latch, so that any partial opening and quick closing of the door
 95 slacks the cord and releases the engagement.

It is desirable to so construct the mechanism that when the mainspring is being wound up the train of gears will not be operated. In order to accomplish this result, the gear-wheel C⁸ is loosely mounted on the main-
 100 spring-shaft and the mainspring-shaft provided with a ratchet *c*⁵, rigidly fixed thereto. The gear-wheel is provided with a pawl *c*⁶, engaging with the ratchet and held yieldingly in such engagement by the tension-spring *c*⁷.
 105 It will thus be seen from an examination of Fig. 8 that as the mainspring is being wound during the rotation of the ratchet in the direction of the arrow the pawl passes over the teeth of the same; but when the mainspring
 110 is released the ratchet engages with the pawl and causes the train of gears and pinions to be operated.

The releasing of the door leaves the parts in position to be operated, so that the main-
 115 spring causes the train of gears and pinions to operate and the record to rotate. It is now desirable that the record shall be used for the purpose of vibrating a diaphragm or similar
 120 element in such manner as to cause sound-vibrations of the atmosphere, so as to utter well-known phrases or pieces of music. In order to accomplish this result, a diaphragm
 125 I is provided and a stylus *i* secured thereto by means of a spring *i'*. Secured to this diaphragm in any desired manner and preferably so as to form a portion of the small tubular part *k* thereof is a horn K, so arranged
 130 that when the diaphragm is vibrated the vibrations cause sound-waves of the atmosphere to be transmitted through the large end of the horn and utter the desired sounds.

The stylus is so arranged that when the main-spring is wound up it engages with the spiral groove in the record at the left side of Fig. 2, and as the record rotates the stylus is moved and carries the inner end of the horn with it toward the right.

When the record has been discharged, it is desirable that the parts be returned to their normal or original position at the left of the record and in position to engage with the spiral groove thereof. In order to accomplish this result, the front end of the horn is loosely supported by a rod L, and the diaphragm is provided with a pin *l*, arranged above a bent rod M, which is slidingly mounted in a bracket *m* on the frame and secured to a vibratable lever *m'*, which is pivotally mounted on the frame. This lever is bifurcated and arranged in the path of a stud or pin N, which is secured to the mainspring-shaft, so that as the shaft rotates and when the mainspring is wound up this pin enters the bifurcation or slot of the vibratable lever and causes the same to be raised, raising thereby the bent rod, which in turn contacts the pin *l* on the diaphragm, raising the stylus out of the groove. As will be seen by looking at Fig. 2, the upper portion of this rod is arranged in an inclined plane, so that the moment the stylus is raised above the record-cylinder the diaphragm and horn may slide down the inclined plane of the bent rod until it contacts the collar or stop *m*². When this stop is reached, the vibratable lever is lowered and the stylus permitted to enter the record-groove and cause the same to discharge the record and again cause sound-vibrations of the atmosphere. The return of the stylus to its normal or starting position in relation to the record depends on the lifting of the carrying-rod, and the movement of such rod depends on the raising of the vibratory lever, which in turn depends on the winding of the power-spring to its full limit, and such winding of the power-spring can only be had with the limit of throw or movement forward of the shaft-arm H, so that each part performs its office or function contingent on the performance by the other parts of their office or function. It will thus be seen that the full throw or movement forward of the arm H is required in order to set the machine for use and that a partial throw or forward movement of such arm will not start the phonograph, because such partial throw or movement does not wind up the spring sufficiently for the vibratable lever to be raised and return the stylus, which remains at the terminus of its travel, and consequently out of use, so that while such partial movement of the arm would wind the power-spring and the spring would operate the gear such operation would not cause the phonograph to operate, as the stylus is in position where it is out of use. An initial throw or movement of the arm H sufficient to raise it out of contact with the spring *h*²

and cause an engagement between the lug and dog would leave the spring *h*² free to act, and a quick stoppage of the door, so as to slack the operating-cord, would make the spring *h*² act and release the lug and dog, so that the door can be freely swung open without imparting rotation to the winding-shaft, thus enabling the device to be operated and permit the door to open and close without affecting the winding devices.

While I have described my invention with more or less minuteness as regards details of form and construction, I do not desire to be limited thereto unduly any more than is pointed out in the claims. On the contrary, I contemplate all proper changes in form, construction, and arrangement, the omission of immaterial elements, and the substitution of equivalents as circumstances may suggest or necessity render expedient.

I claim—

1. In a phonograph of the class described, the combination of a rotatable carrier supporting a record-cylinder, a train of gear for transmitting power and motion to such carrier, a main or driving shaft having a power-spring for rotating such shaft, a vibratable or oscillating pulley loosely mounted around the main shaft, a lever-arm connected with the main shaft and a make-and-break connection between the lever-arm and the pulley whereby the forward advance of the pulley connects the arm and pulley and drives the shaft to wind the power-spring and the limit of winding disconnects the lever-arm and pulley and permits them to rotate independently, substantially as described.

2. In a phonograph of the class described, the combination of a drum supporting a record-cylinder, a train of gearing for transmitting power and motion to the supporting-drum, a main shaft provided with a gear engaging the train of gear and with a power-spring for rotating such main shaft, a vibratable or oscillating pulley loosely mounted around the main shaft and having a cord extending to and connected with a movable object, a lever rigidly secured to the main shaft so as to rotate such shaft and a spring-and-dog mechanism mounted upon the lever and adapted to be engaged by the pulley as it is advanced in a forward direction and wind the spring and to be disengaged from the pulley as the spring reaches the limit of winding for the pulley to return independently of the arm to its initial position, substantially as described.

3. In a phonograph of the class described, the combination of a drum supporting a record-cylinder, a train of gear for rotating the drum, a main shaft provided with a gear engaging the train of gear and with a power-spring for driving such shaft, a vibratable or oscillating pulley loosely mounted around the main shaft and provided with a projecting lug, a lever-arm rigidly connected with the

main shaft, a dog pivotally mounted on the lever-arm and arranged to be engaged by the lug on the pulley as it rotates in one direction, a stop on the lever-arm to limit the movement of the dog in one direction and spring mechanism for throwing the dog into and out of engagement with the lug on the pulley, substantially as described.

4. In a phonograph of the class described, the combination of a drum supporting a record-cylinder, a train of gears and pinions for rotating the drum, a mainspring-shaft provided with a gear engaging with the train of gears and pinions and with a mainspring secured to some fixed or rigid portion of the machine, a pulley loosely and independently mounted around the mainspring-shaft and provided with a projecting lug, a lever-arm rigidly connected with the mainspring-shaft, a dog pivotally mounted on the lever-arm and arranged to be engaged by the lug on the sheave-pulley as it rotates in one direction, a stop on the lever-arm to limit the movements of the dog in one direction, spring mechanism for throwing the dog into and out of engagement with the lug on the sheave-pulley and a stop secured to some fixed portion of the machine and in the path of the dog so that the dog may contact the same when the spring is wound up and be disengaged from the sheave-pulley, substantially as described.

5. In a phonograph of the class described, the combination of a drum supporting a record, a train of gear for transmitting power and motion to the drum, a main shaft engaging with the train of gear and provided with a power-spring for imparting rotation to the shaft, a releasable and self-returnable vibratable or oscillating pulley loosely mounted on the main shaft, a cord secured to the pulley and to some movable body, a coiled spring for the pulley operating to rewind the cord when the pulley is released and a make-and-break connection between the main shaft and pulley operating to connect the two when the pulley is moved in a forward direction and to disconnect them and permit each to rotate independent of the other when the limit of the forward movement is reached, substantially as described.

6. In a phonograph of the class described, the combination of means for supporting a record, a train of gear for transmitting power and motion to the record-supporting means, a main shaft connected with the train of gear, a power-spring for rotating such shaft, a diaphragm provided with a stylus arranged to engage the record and cause sound-vibrations of the diaphragm and means operated by the forward rotation of the main or power shaft in winding the power-spring at the completion of the winding to raise the stylus clear of the record and cause it to return to its initial position for reengagement with the record, substantially as described.

7. In a phonograph of the class described, the combination of means for supporting and rotating a record, a mainspring-shaft provided with a mainspring for transmitting power and motion to the record-supporting means, a diaphragm and stylus arranged to engage with the record and cause sound-vibrations of the atmosphere, a rod having an inclined upper portion adapted to contact the diaphragm and be raised and lowered by the movements of the mainspring-shaft so as to raise the diaphragm and permit it to slide down to its initial position where it can reengage the record then drop out of the way and permit the record to operate the stylus, substantially as described.

8. In a phonograph of the class described, the combination of a drum supporting a record-cylinder, a mainspring-shaft provided with a mainspring for transmitting power and motion to the record-drum, a diaphragm and stylus arranged to be engaged by the record and cause sound-vibrations of the diaphragm, a vibratable lever arranged to be operated by the movements of the mainspring-shaft, a rod connected with such vibratable lever and having an inclined upper portion adapted to contact the diaphragm lift it out of the record and permit it to slide down to its initial position, substantially as described.

9. In a phonograph of the class described, the combination of a drum supporting a record, a mainspring-shaft for transmitting power and motion to the record-drum, a diaphragm and horn connected in one continuous piece and provided with a stylus adapted to engage with the record and cause sound-vibrations, a projection on the diaphragm, a vibratable lever pivotally secured to a fixed portion of the machine and arranged to be vibrated by the movements of the mainspring-shaft, a rod secured to the vibratable lever and having an inclined upper portion adapted to contact the projection on the diaphragm raise it out of connection with the record permit it to slide down to its initial position where it can reengage the record, then drop out of the way and permit the record to operate the diaphragm, and an adjustable stop on the rod to regulate the reengagement of the stylus and record, substantially as described.

10. In a phonograph of the class described, the combination of a drum supporting a record, a mainspring-shaft for transmitting power and motion to the record-drum, a diaphragm and horn connected in one continuous piece and provided with a stylus adapted to engage with the record and cause sound-vibrations, a projection on the diaphragm, a vibratable lever pivotally secured to a fixed portion of the machine and arranged to be vibrated by the movements of the mainspring-shaft, a rod secured to the vibratable lever and having an inclined upper portion adapted to contact the projection on the diaphragm,

raise it out of connection with the record, permit it to slide down to its initial position where it can reëngage the record, then drop out of the way and permit the record to vibrate the diaphragm, an adjustable stop on the rod to regulate the position or reëngagement of the stylus and record, and a rod ex-

tending out over the large end of the horn to which the large end of the horn is loosely secured, substantially as described.

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Witnesses:

THOMAS F. SHERIDAN,

THOMAS B. MCGREGOR.

No. 643,419.

Patented Feb. 13, 1900.

T. B. LAMBERT.
PHONOGRAPH.

(Application filed Oct. 5, 1899.)

(No Model.)

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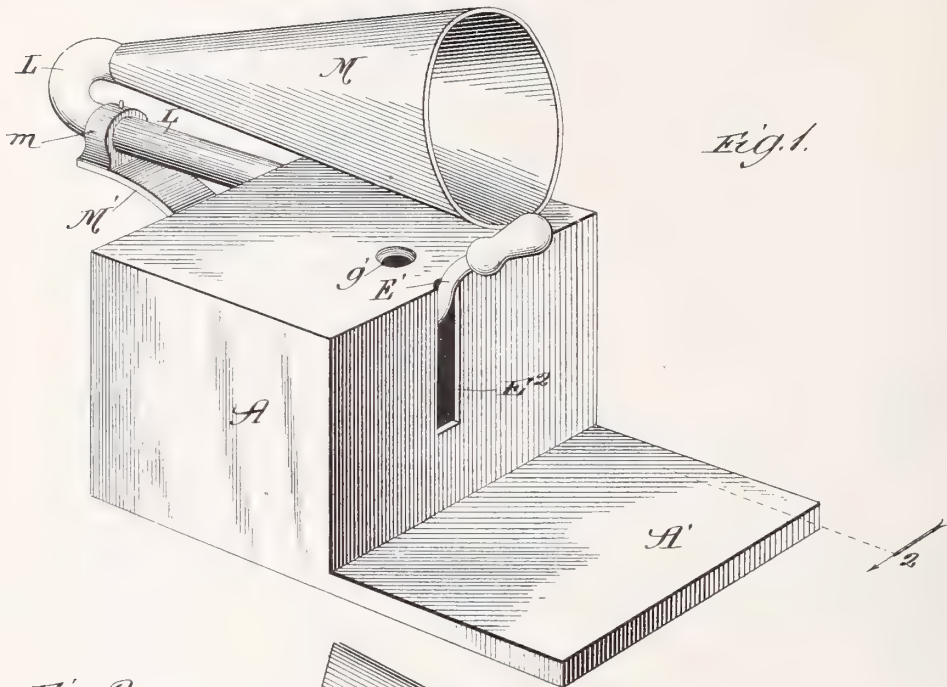
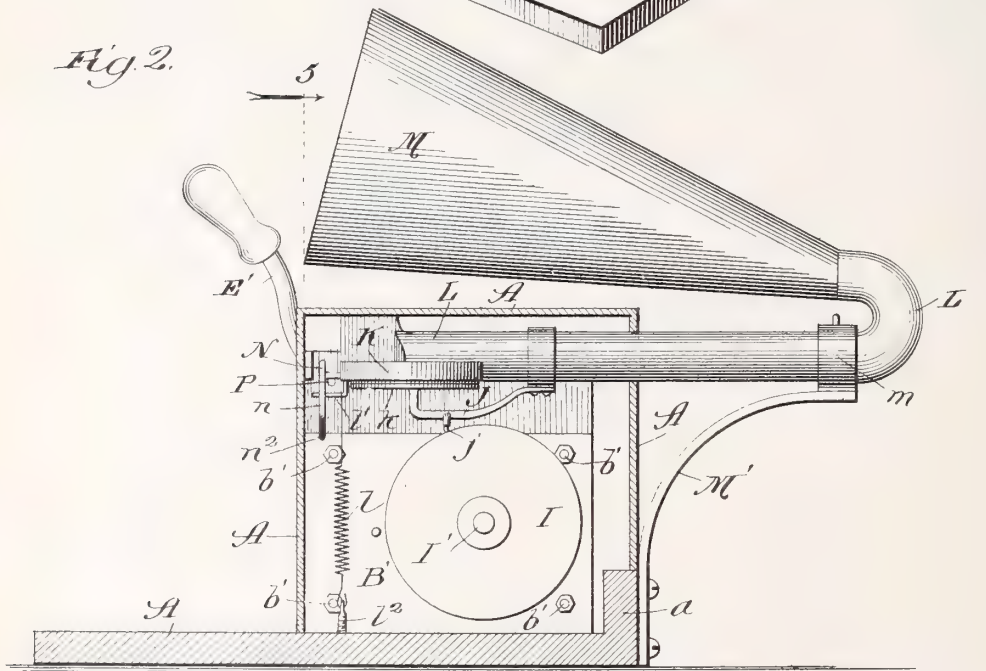


Fig. 2.



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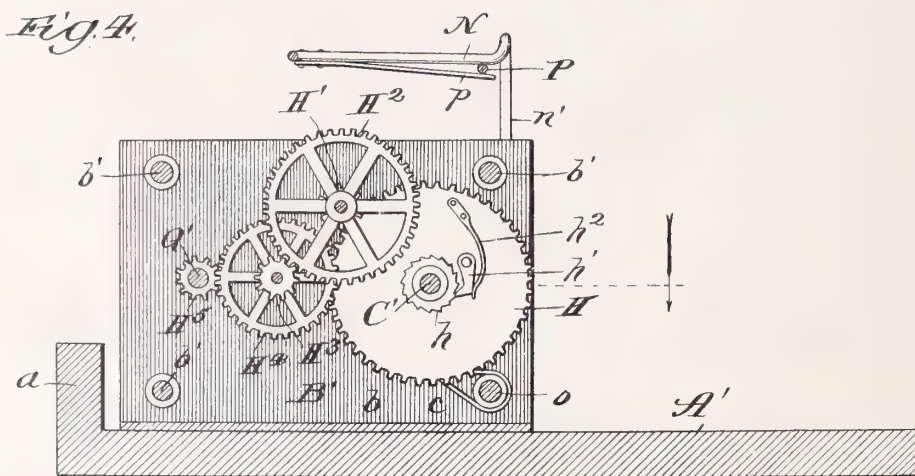
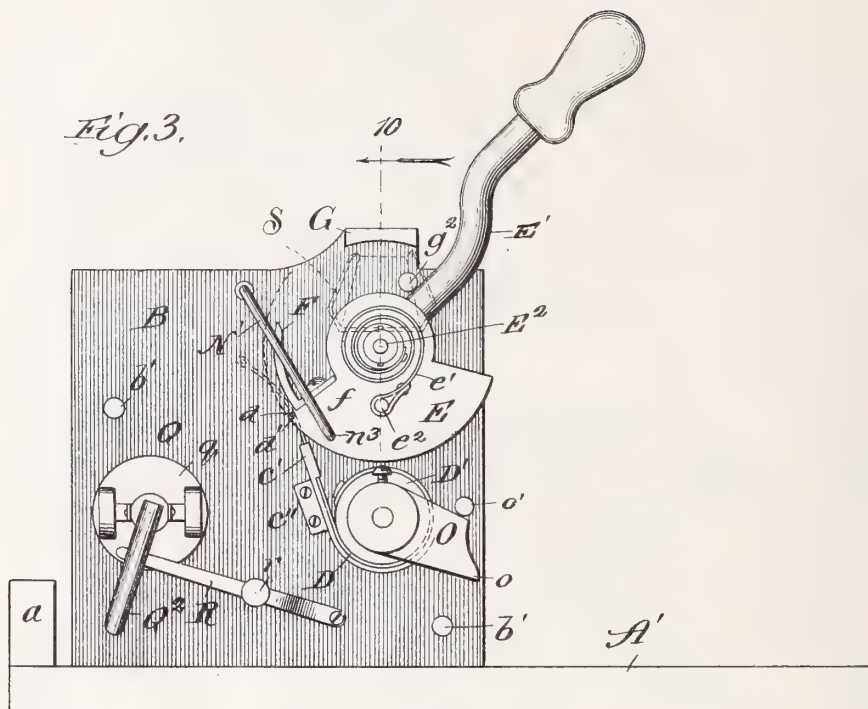
T. B. LAMBERT.

PHONOGRAPH.

(Application filed Oct. 5, 1899.)

(No Model.)

4 Sheets—Sheet 2.



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No. 643,419.

T. B. LAMBERT.

Patented Feb. 13, 1900.

PHONOGRAPH.

(Application filed Oct. 5, 1899.)

(No Model.)

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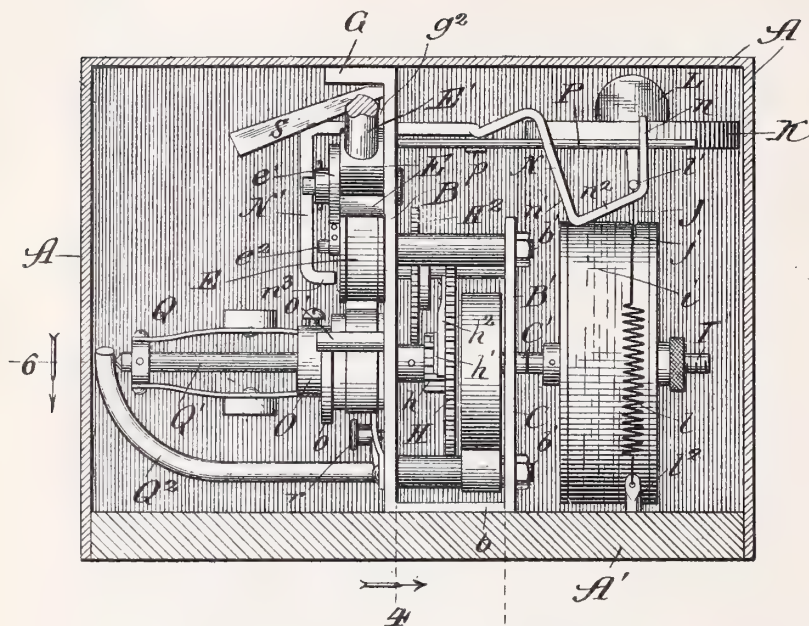


Fig. 5.

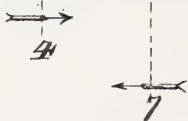
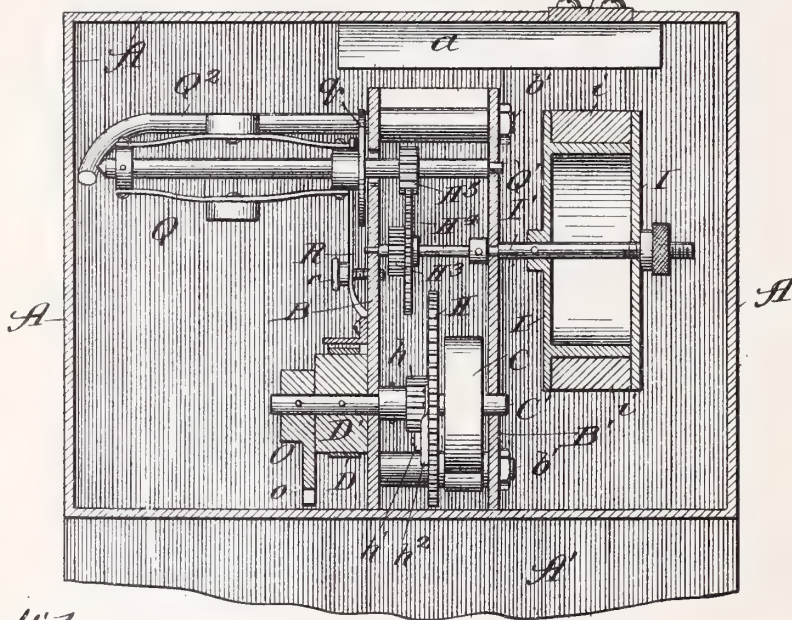


Fig. 6.



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No. 643,419.

Patented Feb. 13, 1900.

T. B. LAMBERT.

PHONOGRAPH.

(Application filed Oct. 5, 1899.)

(No Model.)

4 Sheets—Sheet 4

Fig. 7.

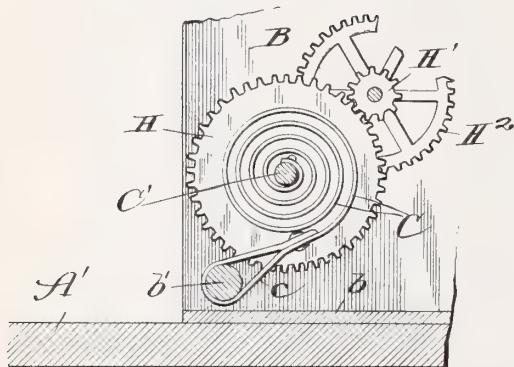


Fig. 8.

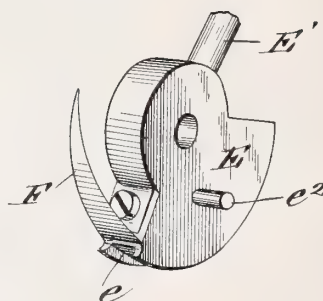


Fig. 10.

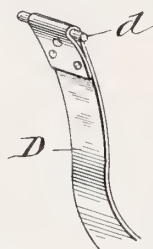
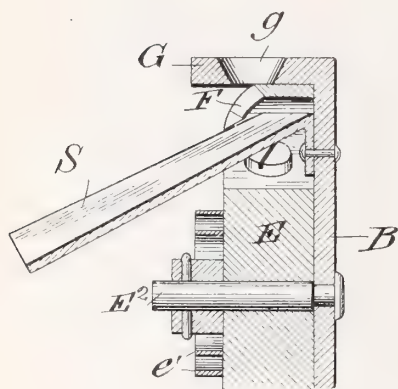
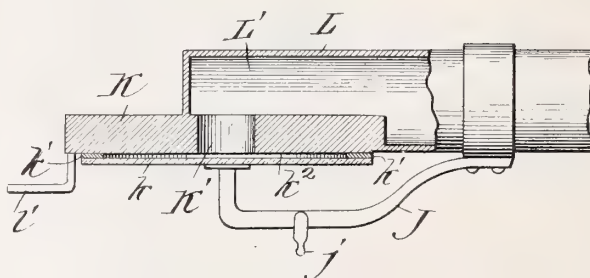


Fig. 9.

Fig. 11.



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Thomas B. McGregg

Inventor:
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By William S. Bauman, Esq. Sheridan,
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UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT, OF CHICAGO, ILLINOIS, ASSIGNOR TO ORSON C. WELLS, ROBERT PRINGLE, ALBERT D. PHILPOT, BRIAN F. PHILPOT, AND HENRY J. COSGROVE, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 643,419, dated February 13, 1900.

Application filed October 5, 1899. Serial No. 732,609. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

The object of my invention is to construct a phonograph the operating parts of which can be inclosed within the case or shell of a cigar-cutter, with the parts so constructed and arranged in relation to the movements of the operating-arm of the blade of the cigar-cutter as to cause such movements to set the mechanism in operation and produce from the record of the phonograph any phrase, words, or sound desired; and the invention consists of the several parts, combinations of elements, and features of construction hereinafter described and claimed.

Referring to the drawings, Figure 1 is a perspective view showing a cigar-cutter with my invention applied thereto; Fig. 2, a sectional view of the casing and base of the cigar-cutter, showing the phonograph in elevation; Fig. 3, a side elevation with the casing or shell of the cigar-cutter removed; Fig. 4, a sectional elevation through the phonograph-operating mechanism with the base in section; Fig. 5, a front elevation of the mechanism with the casing and base in section and the handle of the cigar-cutter broken off; Fig. 6, a section on line 6 of Fig. 4 looking in the direction of the arrow; Fig. 7, a detail in section on line 7 of Fig. 5, showing the main or power spring and a part of the driving-gear; Fig. 8, a perspective view of the segmental head or arm for operating the cutting-blade and the winding-strap; Fig. 9, a perspective view of the free end of the winding-strap; Fig. 10, a detail in section of the segmental head or arm and cutter, showing also the discharge chute or spout; and Fig. 11, a detail, partly in section, of the stylus and its carrying-arm and the diaphragm and parts connected therewith.

All cigar-cutters employ in their construction a movable blade actuated either by means of a projected handle, or a rod having

a vertical reciprocation, or a release-spring, or in some other manner, so that the blade has an advance movement to perform the cutting and is then returned to its normal position for the next operation. It is the purpose of my invention to utilize or employ the movements of the blade in a cigar-cutter to energize the motor of a phonograph, and thereby operate the record either for advertising, amusement, entertainment, or other purpose, and, while this is the main object or design of my invention, it is to be understood that the arrangement, construction, and operation of the parts are adapted for use and can be used in operating phonographs in other ways than through or by the movements of the blade of a cigar-cutter.

In carrying out my invention as applied to a cigar-cutter I provide a case or shell A, mounted on a base A'. Attached to the base, within the casing or shell, is a frame composed of side pieces or plates B and B', with a bottom connection b for attaching the frame to the base by screws or otherwise and, as shown, the plates are supported by cross-rods b'. The power or motor spring C is located between the plates of the frame and is fixedly attached at one end to a main shaft C', and at its free end is attached to one of the cross rods or stanchions b' by a loop c or otherwise, or such end can be attached to some other stationary part of the frame. The shaft C' extends beyond one of the supporting sides or plates of the frame and has fixedly secured thereto a head or drum D', to which is attached one end of a strap D, the free end of which in the form shown has a pin d. In its normal position the free end of this strap is bent away from the head E until the mainspring is unwound, when it is drawn into position for reengagement with the head at the point d. The winding-strap is guided between the head or drum and a guide-plate c, the upper end of which has an inclosing head c', through which the strap passes and is thereby maintained in a straight line of movement and, as shown, the guard or guide is attached to one plate of the frame by a flange or lip c². A segmental head or arm E is located adjacent to the drum

and on one side has a notch or recess d' to engage with the cross-pin of the strap. The acting face of this head or arm has a groove or recess e for the winding-strap, and the head or arm has a handle portion E' and is mounted as a whole loosely on a pin or stud E^2 . The stud has attached thereto one end of a coiled spring e' , the free end of which is looped or otherwise attached to a pin e^2 on the segmental head or arm, which spring is for the purpose of returning the head after each depression or downthrow of the handle, such movement of the handle winding the spring on itself, so as to give the required tension and return the parts. The head or arm carries a knife or blade F , attached thereto by a shank f , and this knife or blade coacts with its companion shear-head G , in which is an opening g , coinciding with a hole g' in the case or shell A for the entering of the tip end of a cigar in position to be severed by the advance of the shear or blade F .

The main shaft C' has loosely mounted thereon a gear H , which gear is adjacent to a ratchet-wheel h , the teeth of which are engaged by a pawl h' , pivotally attached to the gear and held in engagement by a spring h^2 , so that with the winding up of the main or power spring through the revolving of the main shaft from the winding-strap the pawl rides over the ratchet-teeth, but engages therewith at the cessation of the winding, connecting the main gear with the main shaft, so that with the recoil of the power-spring power will be imparted to the gear. The main gear meshes with a pinion H' on a shaft which carries a second gear H^2 , which in turn meshes with a pinion H^3 on the shaft which carries the record, and this shaft also has thereon a gear H^4 , which meshes with a pinion H^5 on the shaft of the governor. It will thus be seen that power from the main-spring is transmitted through the gearing to revolve the record and operate the governor, and this train of gear is all located within the space of the frame formed by the plates B and B' .

The record-shaft has fixed thereon a cylinder I , which carries the record i , one head of the cylinder being removable for taking off and putting on the records. A spring-arm J carries a stylus j to engage the surface of the record. This spring-arm, as shown, is attached by a collar or band to the tube of the sound-amplifying chamber, and its free end is in contact with the diaphragm k , which diaphragm is attached by an adhesive gasket k' or in any other suitable manner to a casing or mounting K , so as to leave a cell k^2 between the diaphragm and the casing. The casing or mounting has a central opening or passage K' , which leads into the sound-amplifying chamber L' , formed by the interior of a tube L , to which the casing or mounting can be secured in any suitable manner, or the end of the tube and the casing or mounting can be made of one piece. The sound-amplifying chamber

at its outer end communicates with the interior of a horn M , secured to the end of the tube L . The tube at its outer end passes through a collar m , pivotally mounted on the end of a supporting-arm M' , secured to a cross-piece a of the base at its lower end in the arrangement shown, and instead of having the collar pivotal so as to turn the tube could be pivotally mounted in a stationary collar, so as to turn and provide for the necessary movement both in a vertical and lateral direction for the engagement and disengagement of the stylus with the record.

A spring l is connected at one end to a pin l' , extending out from the casing or mounting of the diaphragm and attached at its other end to a stud l^2 on the base. The pin l' projects over the outer end of an arm N , which arm is preferably formed of wire and bent so as to have an outer portion n and an inner portion n' , forming the stops for limiting the travel of the stylus and connected by an inclined portion n^2 , which provides the means for returning the stylus at the completion of its operation, as hereinafter described. The arm N extends rearwardly and laterally through the plate B and is continued as a lever N' with a turned end n^3 . The end n^3 is arranged in the path of travel of an engaging face o on an arm O , fixedly attached to the end of the main shaft C' outside of the winding-strap drum. This arm O is moved with the rotation of the main shaft from the winding-strap, and as it moves upward the face o thereof engages the end n^3 and lifts the lever N' , rocking the arm N and raising the outer end of such arm, so that the stylus will be clear of the record and again slide down on the incline N^2 and assume its normal position, and in so sliding down the movement is assisted by the spring l , which spring also assists in maintaining the stylus in engagement with the record-helix. The return movement of the arm O is limited by a pin o' on the frame-plate in the arrangement shown.

The relation between the rotation of the main shaft to wind the main or power spring, the throw of the lever or handle of the cutter to complete the cutting off of the cigar-tip, and the throw of the arm O is such that until the spring is wound to its full limit by the full downward throw of the cutter handle or lever the arm O will not be carried to a position where it will fully raise the lever N' to bring the outer end of the arm N into position to raise and return the stylus. By this arrangement it will be seen that unless the cutting-lever is carried to the full limit of its downward throw the stylus will not be returned to its "normal position," by which is meant its position when ready to operate, and because of this no sound will be produced. This makes the movement of one part entirely dependent on the full movement of the coacting parts in order to have the apparatus perform its full operation or none at all.

A stop-wire P extends across the space of the outer end of the returning-arm of the stylus to prevent any abnormal displacement of the stylus and diaphragm. The speed of the gear can be controlled by any suitable governor. A governor Q, adapted to control the speed, is shown mounted on a shaft Q', with the outer end of the shaft supported on an arm Q². The governor is controlled or regulated by a friction-arm R, preferably of a spring form, which is regulated as to the pressure it exerts on the friction-disk q of the governor by an adjusting-screw r.

The operation will be understood from the foregoing description, but briefly stated is as follows: The tip end of a cigar is inserted through the opening of the case and the stationary shear or blade so as to be severed by the movable shear or blade for the tip when severed to pass into a chute or discharge-spout S to pass down clear of the devices. The chute can be attached to the stop-pin g² for limiting the return throw of the cutter handle or lever or in any other suitable manner, so as to be underneath the cutters, with a clear space for the passage of the movable shear or blade. The full throw of the cutter-handle downward moves the segmental head or arm upward, lifting the winding-strap for such movement through the drum or head to rotate the main shaft and wind the power or main spring, and at the same time with the full throw of the lever or arm O actuate the lever N' and raise the end of the arm N for the return of the stylus to its normal position for engagement with the record. On the release of pressure the pin d on the winding-strap by reason of the bent position of the strap away from the head E will become disengaged from the shoulder d' and will remain so disengaged until the main spring resumes its unwound position. The downward throw of the cutter handle or lever rotates the ratchet for the main gear without engagement with the pawl thereof, so that no movement of the train of gear takes place with the winding of the main or power spring. On the release of the handle or lever to return to its normal position the main or power spring is free to act and start the train of gear to operate the phonograph, and such operation continues with the unwinding of the spring and until the arm O engages the stop-pin o', at which time the stylus has completed its travel and the phonograph has performed its work with the stylus at the end of its movement. The insertion of the next cigar to be cut and the operation of the cutter handle or lever again winds the spring and returns the stylus into position for engaging the record and operating the phonograph. The handle or lever of the cutter can be released at any point in its downward throw and will be returned to normal position by the spring e', which spring also returns the handle or lever after it is released on a full downward throw. The release of the cutter handle or lever at any intermediate

point of a full throw will not reproduce a record, but the parts will automatically be returned to a position where with a full throw of the handle or lever a record can be reproduced. It will thus be seen that in order to reproduce a record there must be a complete throw of the handle or lever, as otherwise the parts are not brought into position for the operation. This gives a perfect control in reproducing a record, as such reproduction can only occur with the full throw of the actuating handle or lever.

The winding-strap is preferably a ribbon of steel or other material possessing rigidity and flexibility, and its connection with the arm or lever by which it is raised is such as to be self-disengaging, and the disengagement is insured by the quick return of the arm or lever through the action of the return-spring e', which acts quicker than does the main or power spring on its return.

I claim—

1. A cigar-cutter having a phonograph connected therewith, and provided with a spring-motor and winding-lever so arranged that the pressing and releasing of the lever operates the mechanism of the phonograph to reproduce a record, substantially as described.

2. A cigar-cutter and a phonograph mounted on a common base and having the casing of the cutter inclosing the operating parts of the phonograph and mechanism for operating the phonograph through the movements of the cutting-blade, such mechanism comprising a spring-motor inside the casing and a winding-lever having its handle end extending outside the casing, substantially as described.

3. In a phonograph, the combination of a main or power spring, a main shaft, a drum on the main shaft and a winding-strap for winding the spring and adapted to be released from engagement at the limit of winding by the removal of pressure and returned into position for rewinding, substantially as described.

4. In a phonograph, the combination of a main or power spring, a main shaft, a drum on the main shaft, a winding-strap, and an arm or head engaging the strap for winding the spring and disengaging the strap by the removal of pressure from the handle of the head to permit the strap to automatically return into position for a rewinding engagement, substantially as described.

5. In a phonograph, the combination of a main or power spring, a main shaft, a drum on the main shaft, a winding-strap, a movable arm or head engaging the strap for winding the spring and permitting the strap to automatically disengage itself on the release of pressure for moving the head, and an arm on the main shaft for limiting the recoil of the spring, substantially as described.

6. In a phonograph, the combination of a main or power spring, a main shaft, a drum on the main shaft, a winding-strap for the

drum, a movable head or arm engaging the strap for winding the spring, a loose gear on the main shaft, a clutch engagement between the gear and the main shaft, and a train of

5 gear actuated from the main gear for operating the record, substantially as described.

7. In a phonograph, the combination of a main or power spring, a main shaft, a drum on the main shaft, a winding-strap, a movable head or arm for the winding-strap, a record actuated by a train of gear from the main or power spring, a guide-arm, a lever for the guide-arm, and an arm on the main shaft for moving the guide-arm lever and shifting the stylus at the completion of the winding movement of the strap, substantially as described.

8. In a phonograph, the combination of a main shaft, a strap for revolving the main shaft to wind a main or power spring, an arm on the main shaft, a lever engaged by the

arm, and an arm actuated by the lever to return a stylus to normal position for engagement with its record, substantially as described.

9. In a phonograph, the combination of a record, a stylus coacting with the record, an arm having an inner and outer limit portion with an inclined face between the limit-points, and a lever for actuating the arm through the movement for winding a main or power spring, substantially as described.

10. In a phonograph, the combination of a main or power spring, a main shaft, a winding-strap, and an arm or head engaging the winding-strap and movable to wind the power-spring, substantially as described.

THOMAS B. LAMBERT.

Witnesses:

BRIAN F. PHILPOT,
EPHRAIM BANNING.

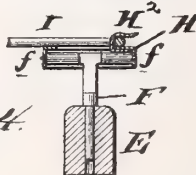
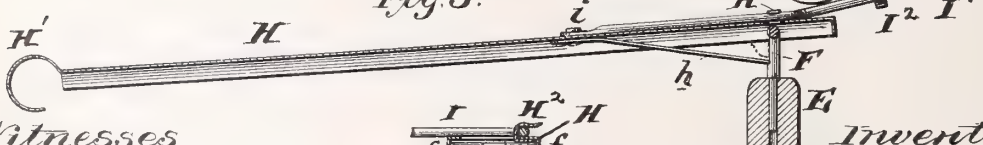
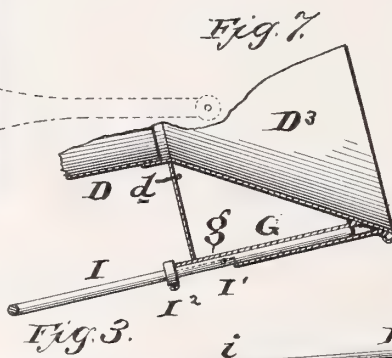
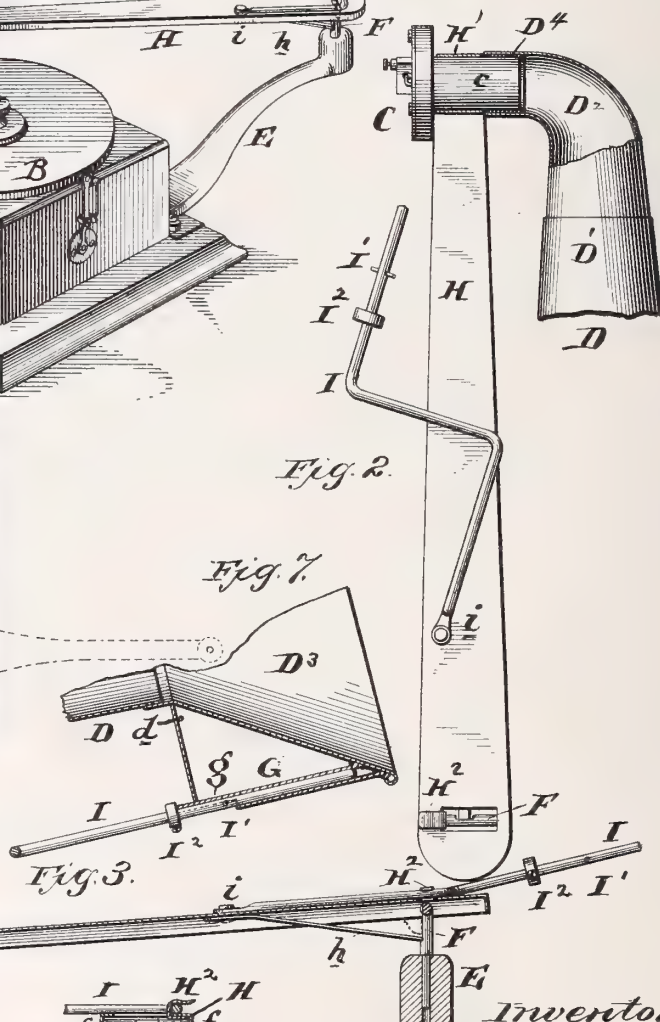
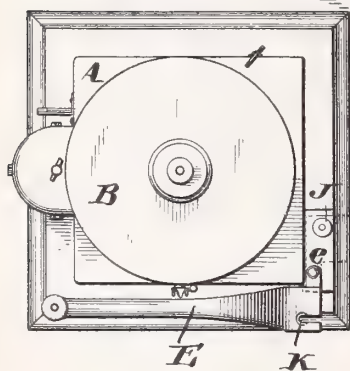
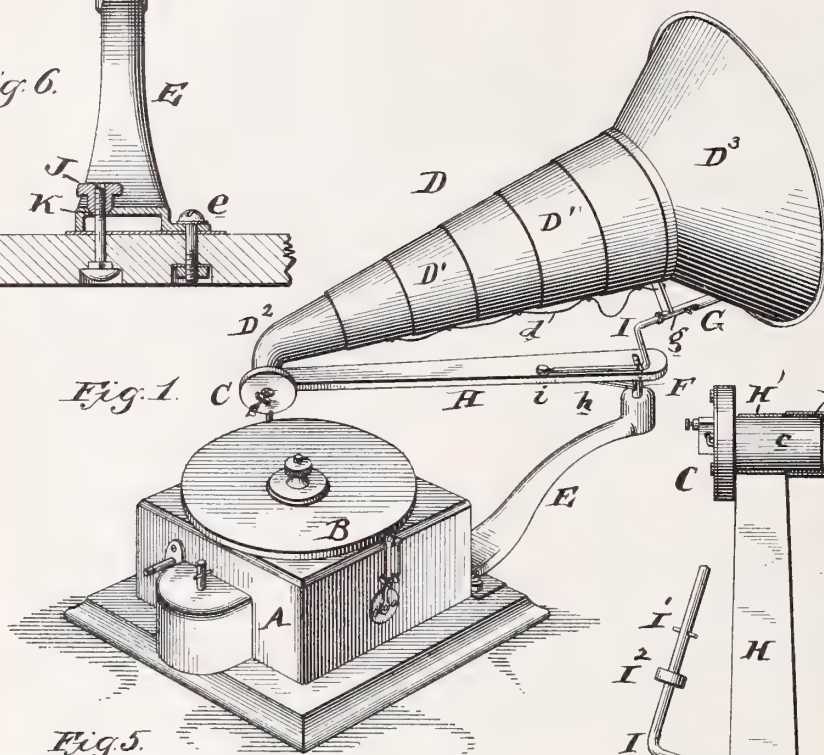
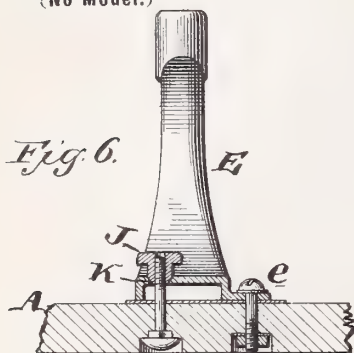
No. 644,834.

Patented Mar. 6, 1900.

H. K. SMITH.
GRAMOPHONE.

(Application filed July 10, 1899.)

(No Model.)



Witnesses
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Inventor
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UNITED STATES PATENT OFFICE.

HENRY K. SMITH, OF PHILADELPHIA, PENNSYLVANIA.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 644,834, dated March 6, 1900.

Application filed July 10, 1899. Serial No. 723,277. (No model.)

To all whom it may concern:

Be it known that I, HENRY K. SMITH, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Gramophones, of which the following is a specification.

My invention has reference to gramophones; and it consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings, which form a part thereof.

The object of my improvements is to so construct and adapt the sound horn or amplifier and its supporting devices to the sound-producing means that it may be condensed when not in use, so as to take up much less room than when in operation, to facilitate shipping and storage, and at the same time retain all of the advantages heretofore existing.

Furthermore, my object is to so support the horn and reproducer that when not in use in connection with the rotating plate or disk it shall be supported in a manner to prevent contact of the stylus or needle point with the table or support for the instrument.

My object is, moreover, to improve the connection of the horn with the reproducer in such manner as to secure increased and more clear sound transmission.

In carrying out my invention I support the horn upon a pivoted arm sustained by a bracket from the main body of the machine and provided with means for limiting the downward movement of its free end, to which the reproducer carrying the needle-point is secured. The horn or amplifier is made of a collapsible construction having its ends made of metal and combined with the supporting pivoted arm in such a manner as to be retained in a stretched or extended condition when adapted for use, but capable of being disconnected and condensed for shipment or storage. In connection with this part of my apparatus I form the elbow of the horn of sheet metal or other hard substance and connect it with the tubular end of the reproducer through a sleeve or lining of fibrous or hard but practically non-resonant material, whereby all metallic, foreign, or rattling sounds of the machine are eliminated from the amplifier. The bracket for supporting the pivoted arm of the amplifier and reproducer is piv-

oted or hinged, so as to turn about its connection to the main frame, and combined with suitable clamping means for holding it in an extended or operating position. In addition to these features there are others of minor importance, but all of which are hereinafter fully disclosed.

My improvements will be better understood by reference to the accompanying drawings, in which—

Figure 1 is a perspective view of a gramophone embodying my improvements. Fig. 2 is a plan view of the pivoted arm for supporting the horn or amplifier, showing parts in section. Fig. 3 is a longitudinal section of same. Fig. 4 is a cross-section of same across its pivotal point. Fig. 5 is a plan view of the gramophone in a partly-dismantled condition, ready for shipping or storage. Fig. 6 is a cross-section showing the jointed connection of the bracket with the main frame, and Fig. 7 is a sectional elevation showing connection of the large end of the horn with its support.

A is the main frame of the gramophone and incloses the motor.

B is the rotating table upon which the disks containing the spiral tracings are clamped.

C is the reproducer and consists of the usual head inclosing a diaphragm against which the needle or stylus or its holder rests. The rear end of the sound-box of the reproducer C is made tubular, as at c.

D is the horn or amplifier and is connected to the reproducer and sustained by the pivoted arm H, which latter is pivoted by a universal joint upon the end of a bracket E, secured to and projecting from the frame A.

The horn or amplifier D consists of a series of tapering tubular sections D', fitting one within the other, so as to make tight joints when extended, but having capacity for collapsing. The inner end section D² is made like an elbow and adapted to fit over the end of the tubular extension c of the reproducer. I prefer to form the sections D' of fiber and the elbow D² of metal or hard resonant material. The large end section or mouth of the horn may be also of metal. In case metal is used I prefer to interpose a tubular lining D⁴ between the elbow and the extension c to prevent rattling and buzzing and movement.

I is a bent-wire rod pivoted to the arm H at i , having a free end adapted to the socket G of the horn. It is further provided with a transverse pin I' to work against the fastened surface g of the socket to hold the horn in an upright position. A collar I², preferably adjustable on the rod, acts as an abutment against which the socket G rests and by which the tension put upon the horn in the direction of its length is secured. This wire I, when in position to support the horn, is snapped under a spring-catch H², but is capable of being turned around on its pivot i , as indicated in Fig. 2, for condensing it for shipment. When in use for holding the horn distended, it will be seen that the wire is pivoted to the arm to one side of the line of tension put upon the horn. To prevent the arm H falling down under the weight of the horn and reproducer C, I provide a stop h , connected at one end to the arm and having the other end adapted to press against the pivot-post F. In practice I prefer to make this stop h of spring metal, so that it may be pressed toward the arm and permit the pivot-post to be turned down to condense it for shipment. It is evident, however, that any suitable stop may be employed between the arm H and post F to limit this downward movement of the free end of the arm. It is also evident that the parts h and I² might be formed integral with the arm. When the horn is condensed, the several portions telescope into each other and are prevented from accidental separation by the employment of the flexible connection or cord d , which is connected at intervals with the several sections.

The bracket E is permanently pivoted to the main frame at e , near one corner thereof, so that it may be turned around, as indicated at Fig. 5, and lie close to the side of the said main frame. The base part of the bracket is furthermore provided with a slot terminating in a depression, as at K, and adapted to receive a clamping-nut J of a fixed bolt j , as shown in Fig. 6. When the bracket is turned from the solid-line position into the dotted-line position in Fig. 5, the clamping-nut J firmly holds it in position.

It is evident that by my improvements I not only secure better and more satisfactory constructions for the parts enumerated than heretofore used, but I am enabled to greatly condense the entire apparatus for storage or shipment.

It is evident that while I have set out the details of construction more particularly preferred the minor details may be modified without departing from the spirit of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a pivoted arm having at its free end a sound-reproducing device, with a horn or sound-amplifier carried by the arm and consisting of a series of sections so as to be collapsible, and means car-

ried by the arm for holding said horn in an extended condition.

2. The combination of a pivoted arm having at its free end a sound-reproducing device, with a horn or sound-amplifier carried by the arm and consisting of a series of sections so as to be collapsible and provided with a socket on the bell-mouth of the horn, and means carried by the arm consisting of a wire or rod having a free end adapted to receive the socket for holding said horn in an extended condition.

3. The combination of a pivoted arm having at its free end a sound-reproducing device, with a horn or sound-amplifier carried by the arm and consisting of a series of sections so as to be collapsible and provided with a socket on the bell-mouth of the horn, and means carried by the arm consisting of a wire or rod having a free end adapted to receive the socket for holding said horn in an extended condition and pivoted to the arm to one side of the line of tension put upon it by the horn, and means to limit the movement of the wire or rod in one direction but permit its adjustment about its pivot in the other direction for packing.

4. In a sound-producing instrument a horn or sound-amplifier consisting of a series of sections telescoping into each other, the smaller end being formed with an elbow of hard material the intermediate sections of non-metallic material and the large end being formed of metal, in combination with means acting upon the two end parts to stretch or hold the parts in an extended condition.

5. In a sound-producing instrument a horn or sound-amplifier consisting of a series of sections telescoping into each other, the smaller end being formed with an elbow of hard material and the large end being formed of metal, in combination with means to stretch or hold the parts in an extended condition, and a flexible connection between several of the sections to connect them with the largest section and prevent relative displacement when collapsed.

6. In a speaking instrument, the combination of a sound-reproducing device having a rigid tubular end, a horn or sound-amplifier having an elbow at the small end of metal or other hard resonant material receiving the tubular end of the reproducing device, and an interposed washer or packing of non-resonant material fitting tightly and forming a practically-rigid joint between the tubular end of the reproducing device and the end of the amplifier.

7. In a speaking instrument, a sound-amplifier or horn, consisting of a series of sections telescoping into each other and tapering so as to form when extended a horn-shaped structure the intermediate section being formed of fiber, or non-metallic resonant material and the small end and bell-mouth or larger end section being formed of metal, in

combination with suitable means connecting with the end sections for holding the horn or sound-amplifier in an extended condition.

5 8. In a speaking instrument, the combination of a moving record, a supporting-bracket located to one side of the moving record, a vertical pivot-pin supported in the end of the bracket and free to revolve about a vertical
10 axis, a freely-movable arm jointed to the vertical pin on a transverse axis, a suitable stop connected to the movable arm and directed backward and downward so as to strike
15 against the vertical pin above the bracket and limit the downward motion of the movable arm without obstructing in any manner its lateral motions upon the bracket, and a sound-reproducing device carried upon the free end of the arm and having a needle-point acting upon the moving record.

20 9. In a speaking instrument, the combination of an arm pivoted so as to have universal movement, a sound-reproducing device carried at the free end of the arm, a bracket extending close to the pivoted end of the pivoted arm, an upright pin pivoted on a vertical
25 axis in the end of the bracket and connected to the pivoted arm on a transverse axis whereby the arm is universally jointed close to its outer end, and a stop wholly connected to the arm and having its lower end
30 arranged in alinement with the vertical pin whereby when the arm is free the stop is caused to abut against the pin to limit the downward motion of the free end about the
35 transverse axis but which when the instrument is in operation is out of contact with the vertical pin.

40 10. In a gramophone instrument, the combination of a pivoted arm carrying at its free end a sound-reproducing device, a support for the arm at its pivoted end consisting of the bracket E extending outward and upwardly close to the arm, a hinge device F pivoted to the end of the bracket on a vertical

axis and connected with the arm on a trans- 45 verse axis, and a stop-finger h secured to the under side of the arm and projecting backward and downward so as to abut against the vertical pin only when the outer end of the arm is unsupported, the construction being 50 such that when the arm is in its normal position during the operation of the instrument the stop-finger h has no connection with the vertical pin.

11. In a speaking instrument of the character described, the combination of the rotating table, a box-like structure inclosing the power devices for moving the table, a sound-reproducer adapted to be moved over the table, a pivoted arm carrying the sound-repro- 60 ducer, and a bracket E to which the arm is pivoted said bracket being pivoted at e to the box-like structure adjacent to one corner thereof so that the arm may be swung around parallel to the box to condense the machine 65 for shipment, and a suitable clamping device for clamping the base of the bracket to the box-like structure whereby the arm is held in a rigid extended condition when the machine is in operative adjustment. 70

12. In a gramophone instrument of the character described the universal pivoted arm H formed of sheet metal with top horizontal and sides bent at an angle to the top surface so as to project vertically downward for strengthening purposes and further having the free 75 end of the horizontal top curved to form a tubular socket for receiving the sound-reproducer, in combination with a vertical pivot-pin jointed to the arm on a transverse axis 80 extending through the sides at its end most distant from the tubular socket.

In testimony of which invention I hereunto set my hand.

HENRY K. SMITH.

Witnesses:

R. M. HUNTER,
R. M. KELLY.

No. 644,981.

Patented Mar. 6, 1900.

W. HART.
GRAPHOPHONE REPRODUCER.

(Application filed Nov. 22, 1897.)

(No Model.)

Fig. 1.

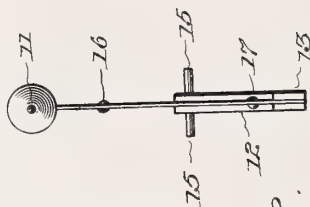
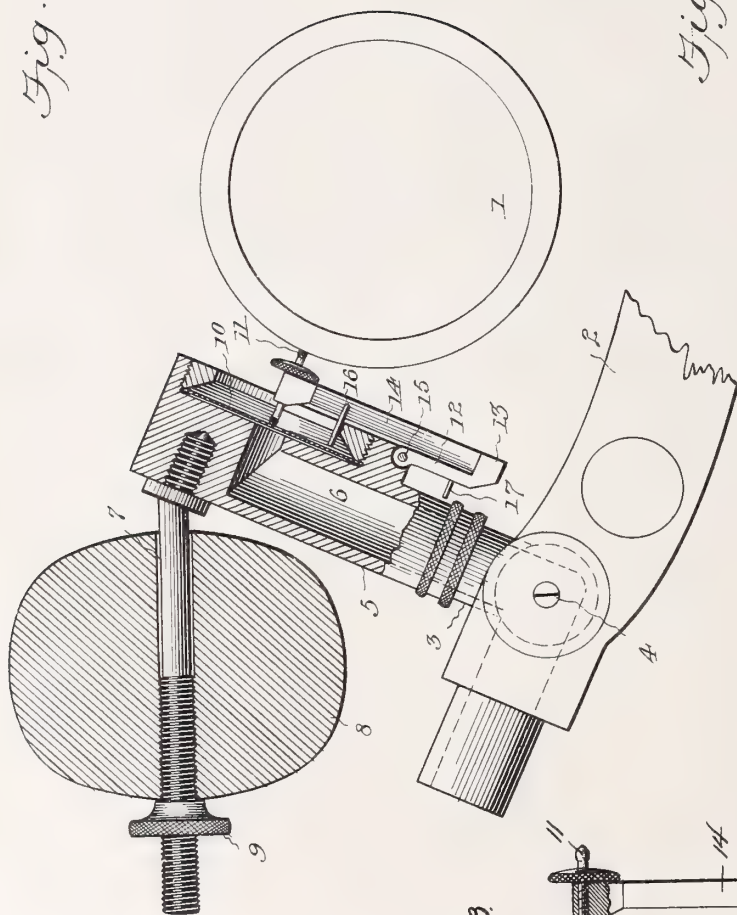
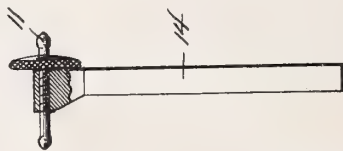


Fig. 2.

Fig. 3.



Witnesses

E. N. Monroe
V. B. Hillyard.

By his Attorneys,

C. A. Snow & Co.

Inventor
William Hart,

UNITED STATES PATENT OFFICE.

WILLIAM HART, OF KIRKSVILLE, MISSOURI.

GRAPHOPHONE-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 644,981, dated March 6, 1900.

Application filed November 22, 1897. Serial No. 659,434. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HART, a citizen of the United States, residing at Kirksville, in the county of Adair and State of Missouri, have invented a new and useful Graphophone-Reproducer, of which the following is a specification.

This invention relates to means for reproducing sound from a record obtained in any of the known ways, and is applicable to graphophones or like machines in which the reproducer embodies a diaphragm and a stylus, the latter following the record and causing vibrations in the diaphragm similar to those resulting in the record, whereby the sound-waves are such as to reproduce the original.

The object of this invention is to secure volume and distinctness and to enable the pitch to be varied according as the horn or tubes are to be used; also, to obviate lost motion between the stylus-bearing arm, the reproducer and its support, and to enable the stylus to adapt itself to the record without necessitating a loose or pivotal joint between the reproducer, and its support which is the chief source of trouble in not securing satisfactory results in this class of machines.

For a full understanding of the merits and advantages of the invention reference is to be had to the accompanying drawings and the following description.

The improvement is susceptible of various changes in the form, proportion, and the minor details of construction without departing from the principle or sacrificing any of the advantages thereof, and to a full disclosure of the invention an adaptation thereof is shown in the accompanying drawings, in which—

Figure 1 is a detail view showing the invention in operative relation. Fig. 2 is a front view of the arm bearing the stylus. Fig. 3 is a detail view showing the screw-thread connection between the stylus and its carrying-arm.

Corresponding and like parts are referred to in the following description and indicated in the several views of the drawings by the same reference characters.

The record-cylinder 1 is supported in the usual manner peculiar to the style of machine to which it is applied, and these mountings are not shown, because they form no part of

the present invention and vary with the different makes of machines. The bracket or support 2 has an elbow-shaped tube 3, pivoted thereto at 4 in the ordinary way, and the reproducer 5 is applied to one arm or member of the tube 3 by means of a slip or other joint, and the horn or ear tube is fitted to the opposite end of the tube 3 in the usual manner.

The reproducer has a passage 6, which registers with the member of the tube 3 to which it is fitted, and is counterbalanced, a rod 7 being applied to its upper end and extending away from the cylinder 1 and threaded to receive a weight 8, which latter is adjustable on the rod, so as to establish nearly an equilibrium between the weight and the reproducer, whereby the latter is free to respond to the vibrations of the stylus to cause the diaphragm to vibrate in consonance with the stylus, so as to produce well-defined sound-waves, which will result in a clear and distinct sound corresponding as nearly as possible with the original as can be reproduced by mechanical appliances. A binding-screw 9 is applied to the threaded end of the rod 7 to secure the weight 8 in an adjusted position when the reproducer is equiposed. The diaphragm 10 is secured to the frame of the reproducer in any of the usual ways, so as to vibrate freely, and its central portion comes directly opposite the deflected end of the passage 6, whereby the confined air may receive the full benefit of the maximum vibrations of the diaphragm and reproduce the sound in a clear, distinct, and audible manner.

The arm bearing the stylus 11 is composed of two parts, a pivoted member 12, having its lower end formed with a lateral extension 13, and a spring member 14, having a head at its upper end, which is internally threaded to receive the stylus 11, which latter is exteriorly threaded and is provided at its ends with the usual points to bear against the record and diaphragm, respectively. The member 12 has journals 15 at its upper end, which obtain a bearing in the reproducer-frame, thereby admitting of the stylus moving rapidly between the diaphragm and record, which is essential to the operativeness of the machine. The parts are disposed so that the stylus comes directly opposite the center of the diaphragm.

The spring member 14 is thin and comparatively wide and is placed with its greatest width in the direction of the stylus, thereby preventing any movement of the part 14 in a plane at right angles to the diaphragm and record independent of the movement of the vibration of the arm upon its journals 15 and with the stylus 11.

A pin 16 is rigidly attached to the member 14 and is located a short distance from the stylus 11, so as to engage with the diaphragm near its edge when the stylus 11 has been unscrewed, so as to withdraw it from engagement with the diaphragm. This construction provides for moderating the sound, so as to prevent a person standing near the machine from hearing the reproduction without the use of an ear-tube, which is of advantage when the privilege of listening to the machine must be paid for. A second pin 17 is applied to the pivoted member 12 and constitutes a stop to engage with the frame of the reproducer and prevent the arm bearing the stylus from falling away from the reproducer too far when the latter is raised and slid back to the head to pass over another record.

As previously explained, the arm 14 is adapted to yield laterally or in a plane parallel with a diaphragm and record, thereby enabling the stylus to adapt itself to the groove of the recording-cylinder when lowering the reproducer into an operative position. This construction obviates the provision of a loose joint between the reproducer and its support, which has been found objectionable because of the lost motion generally existing in a pivotal joint of this character.

The weight 8 may be conveniently disposed and by preference is placed above the bearing of the reproducer, although it may be located below the bearing or in any relation so long as it serves to counterbalance the reproducer, so that the stylus will bear lightly upon the record and the diaphragm engage lightly with the stylus.

Having thus described the invention, what is claimed as new is—

1. In a graphophone, the combination of a record and a reproducer comprising a diaphragm, of a resilient stylus-carrying arm having a pivotal connection at one end with the reproducer-frame to permit of its oscilla-

tion in a direction toward and away from the diaphragm, the resiliency of said stylus-carrying arm also permitting a movement, independent of its pivotal motion, transversely of the faces of the diaphragm and record, and a stylus adjustably mounted in said arm and adapted for adjustment with respect thereto in a direction toward and away from the record, substantially as described.

2. In a graphophone, the combination of a record and a reproducer comprising a diaphragm adapted to vibrate at right angles to the face of the record, of a flat stylus-carrying spring-arm having a pivotal connection at one end to a fixed point of attachment on the reproducer-frame to permit the stylus to freely vibrate in a direction toward and away from the diaphragm, said flat spring-arm being arranged edgewise with reference to the faces of the diaphragm and record to prevent independent movement thereof in the direction of vibration of the stylus and permitting the same to move transversely of the faces of the diaphragm and the record, and a stylus adjustably mounted in said arm and adapted for adjustment with respect thereto in a direction toward and away from the record, substantially as set forth.

3. In a graphophone, the combination with the reproducer, of a pivoted arm bearing a stylus and a pin which are relatively adjustable, whereby either the stylus or pin may be caused to engage with the diaphragm, substantially as described.

4. In a graphophone, the combination with the reproducer, of a pivoted arm, a stylus having adjustable connection with the pivoted arm to engage centrally with the diaphragm, and a pin attached to the said pivoted arm and adapted to engage with the diaphragm at a point remote from its center upon moving the stylus outward or away from the diaphragm, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM HART.

Witnesses:

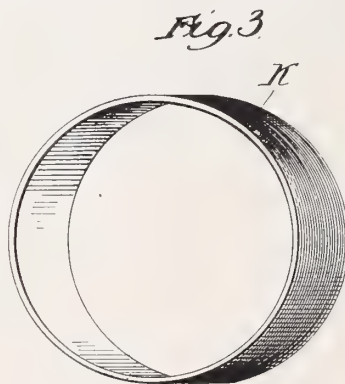
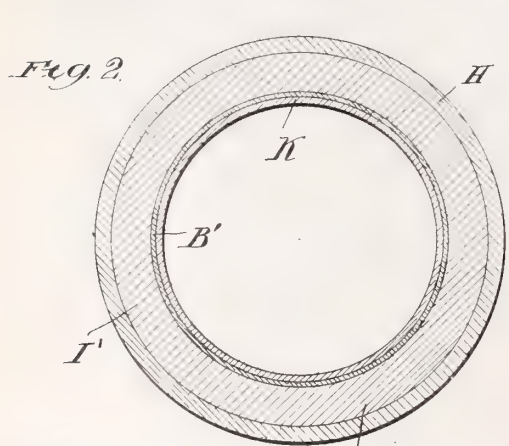
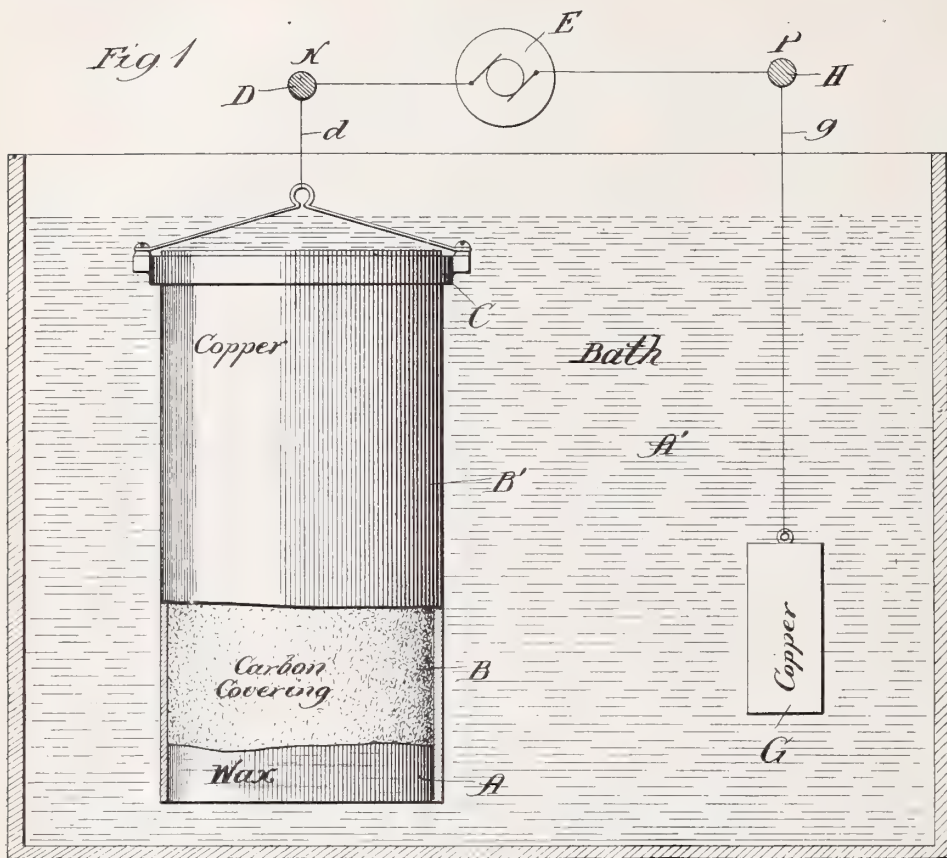
MYRON A. MILLER,
J. W. HELME.

T. B. LAMBERT.

METHOD OF REPRODUCING PHONOGRAPH RECORDS.

(Application filed Aug. 14, 1899.)

(No Model.)



Witnesses.

Type Metal

Inventor.

Lute S. Allen
Thomas B. Mc Gregor

Thomas B. Lambert
By Banning & Banning & Sheridan
Attys.

UNITED STATES PATENT OFFICE.

THOMAS B. LAMBERT, OF CHICAGO, ILLINOIS, ASSIGNOR OF THREE-FIFTHS
TO BRIAN F. PHILPOT AND JOSEPH POWELL, OF SAME PLACE.

METHOD OF REPRODUCING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 645,920, dated March 20, 1900

Application filed August 14, 1899. Serial No. 727,183. (No model.)

To all whom it may concern:

Be it known that I, THOMAS B. LAMBERT, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Processes for Producing Record - Cylinders for Phonographs, of which the following is a specification.

My invention relates to that class of mechanisms which are styled "record-cylinders" and which are adapted to be used in connection with phonographs and similar instruments—that is, instruments adapted to be operated for the purpose of vibrating a diaphragm and imitating speech and musical notes.

The invention relates particularly to a cylinder and the material of which it is formed, so as to render it of excessive longevity by the use of material practically infrangible, and, further, to the means, methods, or processes by which this and duplicate cylinders may be produced, all of which will more fully hereinafter appear.

The principal object of my invention is to provide a simple, economical, and efficient method for constructing infrangible record-cylinders.

A further object of the invention is to provide a record-cylinder of such material as to render it practically infrangible; and the invention consists in the methods, features, combinations, and details of construction hereinafter described and claimed.

In the drawings, Figure 1 is a vertical sectional elevation of a bath containing an electrolytic solution adapted to electrically form a matrix by which a record-cylinder for phonographs may be produced, showing other elements attached, as will be more fully hereinafter explained; Fig. 2, a plan view of a completed matrix, and Fig. 3 a perspective view of a completed record-cylinder.

In the art to which this invention relates it is well known that it is desirable to produce a record-cylinder of such nature and construction as will make it practically indestructible, and, further, to provide means and methods by which such a cylinder can be economically and efficiently formed and du-

plicated in quantities as desired. To these features my invention principally relates.

In forming a record-cylinder I first take and make an impression upon a wax cylinder A (see Fig. 1, in which the wax cylinder is in the bath) in an ordinary phonograph, and then remove this wax cylinder from the phonograph and provide it at one end with a coating of carbon B or other electric conducting material. I next place this cylinder in an electrolytic bath, having first surrounded and connected it with a metal ring C, which is supported on a metal rod D by means of a wire *d* and connected with the negative pole of a dynamo E. This cylinder, with its attached mechanism, is then placed, as above suggested, in the electrolytic bath, which brings it in circuit with the anode G, of copper or other metal, hung by means of a metal wire *g* upon a metal rod H and connected with the other pole of the dynamo. The dynamo being started, the copper is electrically deposited upon the carbon-coated wax cylinder, and after it has reached the desired thickness forms a copper cylinder, which is then removed from the bath and disconnected from the dynamo. The wax is next shrunk by means of cold application, so that the copper cylinder may be removed therefrom. These operations form a copper cylindrical matrix *b'*, the inner cylindrical surface of which contains a counterpart of the impressions on the wax cylinder. It is desirable now to produce the indestructible record-cylinders from this copper matrix in quantities as desired. To accomplish this result, the matrix is placed inside of a metal ring I, considerably larger in diameter than the matrix, and the space between the same filled with type-metal I', which securely locks the matrix in position and furnishes a firm backing for the same. I next take a soft ring of cellulose or vulcanized rubber, either in a raw or partially-cured state or previously softened with some solution and of sufficient thickness to receive in perfect form the indentations of the matrix and at the same time furnish a suitable backing or support for the phonographic reproduction of the record. This relatively-thick ring or tube is then

placed within the cylindrical opening of the matrix and by means of an expansive pressure with heat forced outwardly, completely filling the matrix and against the inner surface thereof, thus making a counterpart of the same and a record similar to that on the original wax cylinder. The ring thus formed, having on its outer face a faithful imprint of the matrix, is then allowed to harden, either naturally or by artificially curing the substance thereof, through which hardening it shrinks sufficiently to enable its subsequent removal to be made from the matrix without injury to either. As a shrinking or reducing medium I have used a solution of hydrochlorous acid and water in which the tube and matrix are placed, as above, so that the tube can be removed from its engagement with the matrix. When it has become dried and hardened, it forms a cylinder K, as shown in perspective view in Fig. 3, preferably of cellulose, and which is practically infrangible. I prefer to use cellulose for this purpose in that it is easier to manufacture and more durable in operation, though the same method may be used for forming cylinders of different materials.

In carrying out my process it is an absolute requirement that the blank phonograms or tubes must be of a thickness to receive and retain in a perfect form the indentations of the matrix and at the same time have within itself a sufficient backing or support for the reproduction of the record phonographically after the formation of the record on its face and the removal of the tube from the matrix. It is practically impossible to use very thin walled tubes or hollow cylinders for my process, because the phonographic reproduction of sound from such thin records, supposing the tubes to be capable of even temporarily maintaining or holding their shape, would be weak, distorted, indistinct, and imperfect; but as a matter of fact the records themselves made of thin material are not capable of retaining their shape and would be impractical in actual use. By using a relatively-thick-walled tube or hollow cylinder the objections which would occur in practice with a very thin tube are entirely overcome and the produced records are a merchantable article. It is to be understood that in applying pressure

to the interior of the tube or cylinder for forcing the same outwardly and against the face of the matrix such pressure must be simultaneously exerted over the entire surface of the tube or cylinder and in a uniform manner, so as to simultaneously force the entire exterior surface against the interior face of the matrix, for if otherwise there would be great danger and liability of a flow of material and a consequent distortion therefrom, producing an imperfect record.

I claim—

1. The method of producing record-cylinders for phonographs, which consists in first forming a record on a cylinder of wax or other relatively-soft material, rendering the surface of the wax cylinder electrically conductive and electrolytically depositing metal thereon, forming a matrix and then outwardly expanding under pressure within the matrix, a cylinder or tube of softened material sufficiently thick to maintain its shape during and after the act of disengagement from the matrix and finally removing the cylinder or tube by direct longitudinal movement, substantially as described.

2. The method of producing record-cylinders for phonographs which consists in first forming a record on a cylinder of relatively-soft material such as wax, then coating such cylinder with carbon or other electric conducting material, and electrolytically depositing metal thereon forming a matrix, then shrinking the soft cylinder to remove the electrically-formed matrix and backing such matrix to form a matrix-mold, then outwardly expanding under pressure a cylinder or tube sufficiently thick to maintain its shape after disengagement from the matrix and of softened material such as cellulose, within the matrix for the pressure to reproduce on the outer surface the counterpart of the indentations in the matrix, then allowing such cellulose cylinder or tube to harden within the matrix and removing the record cylinder or tube from the matrix and then drying and hardening the record-cylinder, substantially as described.

THOMAS B. LAMBERT.

Witnesses:

THOMAS F. SHERIDAN,
ALBERT D. PHILPOT.



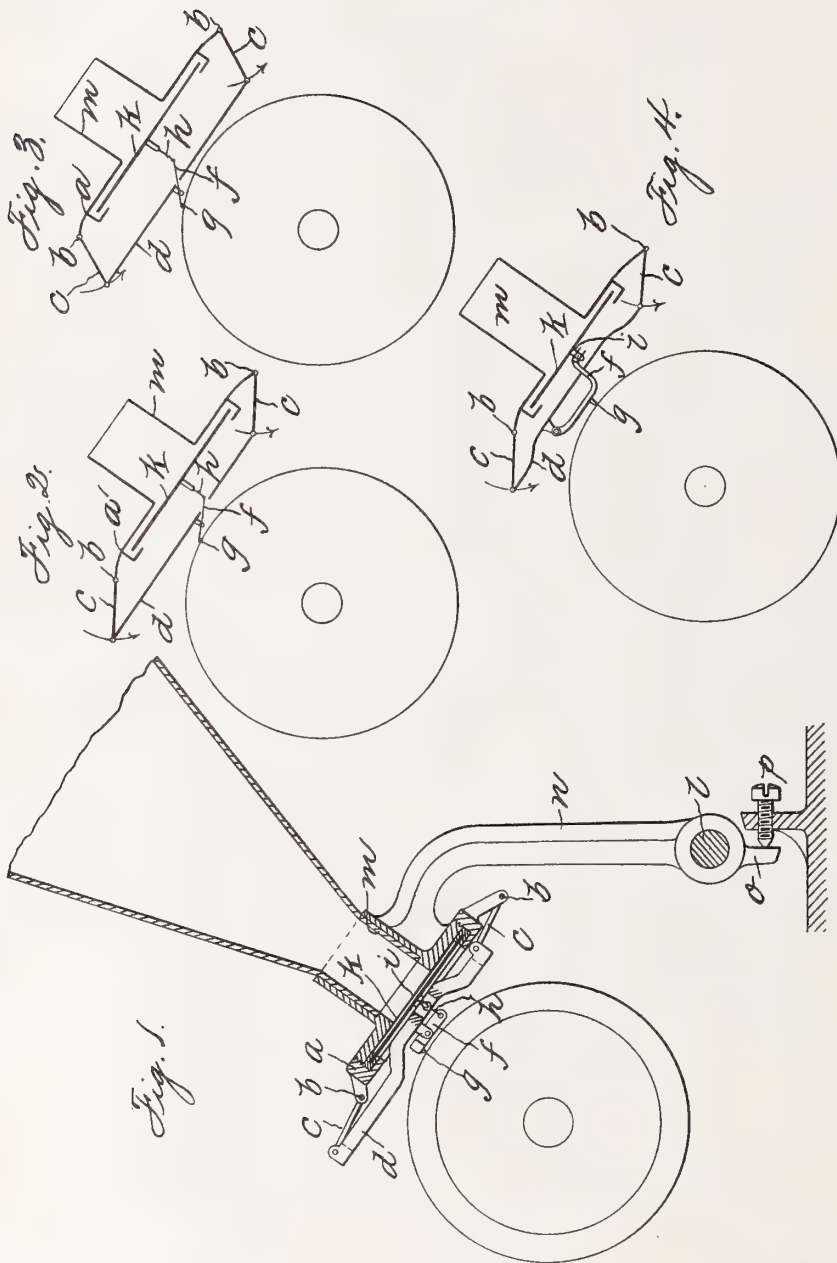
No. 646,014.

P. VON WOUWERMANS.
PHONOGRAPH.

Patented Mar. 27, 1900.

(Application filed Sept. 25, 1897.)

(No Model.)



Witnesses:
A. Ober,
B. Sommers.

Inventor:
Philippe von Houwermans
by *[Signature]*
J. H. H. H.

UNITED STATES PATENT OFFICE.

PHILIPP VON WOUWERMANS, OF VIENNA, AUSTRIA-HUNGARY, ASSIGNOR
OF NINETEEN TWENTY-FIFTHS TO THEODOR FISCHER, MAX RAPHAEL
KALDEGG, AND IGNAZ PULAY, OF SAME PLACE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 646,014, dated March 27, 1900.

Application filed September 25, 1897. Serial No. 653,023. (No model.)

To all whom it may concern:

Be it known that I, PHILIPP VON WOUWERMANS, a subject of the Emperor of Austria-Hungary, residing at Vienna, in the Province of Lower Austria, in the Empire of Austria-Hungary, have invented certain new and useful Improvements in Tension Devices for Phonograph-Diaphragms, (for which Letters Patent have been obtained in Austria, dated July 9, 1897, registered Vol. 47, folio 2650;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

The experience heretofore obtained with phonographs has shown that the tension of the diaphragm—that is to say, the pressure with which the recording-knife cuts into the wax roller—must in the case of spoken language be different to that for recording singing, whistling, and music; also, that when reproducing-pin shrill tones, both spoken and musical, are capable of being rendered clearer or softer by producing a greater tension of the diaphragm.

Now the apparatus which forms the subject of the present invention and which is designed to effect in a perfect manner this twofold object produces a continual intimate contact of the recording-pin or of the reproducing-pin with the roller and also imparts to the diaphragm a certain tension which can be adjusted to suit requirement. This apparatus is characterized by the fact that the pivot of the lever which connects the diaphragm with the recording-pin or with the reproducing-pin is loaded by a weight which is rendered capable of movement by means of a parallel motion, so that when the body of the diaphragm is adjusted relatively to the roller by means of regulating device the pressure of the pin upon the roller—that is to say, the tension of the diaphragm—will be varied.

Figure 1 of the accompanying illustrative

drawings shows, partly in vertical section and partly in elevation, one construction of tension apparatus according to this invention. Figs. 2 and 3 show the loading device in two other different positions, and Fig. 4 illustrates the same in combination with another arrangement of lever for the recording-pin or the reproducing-pin.

In the device for holding the diaphragm—such, for example, as the clamping-ring *a*—there are arranged parallel to the roller-axis and opposite to each other two pivots *b*, upon which are mounted so as to be capable of turning thereon two radius or guide links *c*, which are connected together by a cross-piece *d* of determined weight and of a length exactly equal to the distance between the pivots. This cross-piece, which is suspended from the radius-links and which, together with the latter and with the clamping-ring, forms a parallelogram of levers, carries the two-armed lever *f*, which holds at one end the recording-knife (or reproducing-pin) *g* and is connected at its other end, by means of a small hook *h*, to a ring *i*, which is fixed to the diaphragm *k*.

Fig. 1 shows that position of the parallelogram in which the cross-piece *d* bears with its whole weight upon the pivot of the knife or pin lever *f*, and consequently tightens the diaphragm, so as to form an intimate contact between the knife or recording-pin *g* and the roller. On increasing the distance between the diaphragm and the cross-piece *d* by rotating the radius-rods *c* downward the pressure of the cross-piece upon the lever-pivot becomes continually smaller, Figs. 2 and 3. When the radius-rods have been turned down to such an extent as to be at right angles to the cross-piece, the pressure—that is to say, the tension—of the diaphragm becomes *nil*, and on further rotation beyond the *nil* or zero position an actual lifting action will take place until the radius-links become vertical.

Now for the purpose of enabling the diaphragm to be moved more or less away from the roller, and thereby of imparting a different position to the radius-links *c* corresponding to the desired tension of the diaphragm, the diaphragm-casing is rendered movable by

means of a regulating device, which may consist—for example, as shown in Fig. 1—of a lever-arm *n*, which holds the casing *m* and is arranged to oscillate about the axis *l* and which can be adjusted by means of a regulating-screw *p*, acting upon its shoulder or short arm *o*. The regulating device may also consist of a fixed guide-rod, along which the diaphragm-casing can be screwed or fixed higher or lower, as desired.

Obviously the tension device hereinbefore described can also be connected with a one-armed knife-lever or contact pin-lever *f*, as shown in Fig. 4. In this manner the transmitted vibrations can be increased by choosing a suitable ratio between the length of the lever-arms in a well-known manner.

When compared with the loading-weight (which in phonographs heretofore employed has been constructed as a one-armed lever capable of being oscillated about a fixed point) for the pivot of the knife-lever or contact pin-lever, the apparatus herein described has the great advantage that the entire weight is compelled to share the vibrations, because it is moved parallel to itself, and it can therefore oppose a considerably-greater resistance to the said vibrations.

I claim—

1. In a phonographic producer or reproducer, the combination with the diaphragm, of a parallel motion, a stylus or reproducing-point connected with said parallel motion and the diaphragm, substantially as set forth.

2. In a phonographic producer or reproducer, the combination with the diaphragm, of a parallel motion, a lever pivoted to one member of said parallel motion and connected to the diaphragm, and a stylus or a reproducing-point on said lever, substantially as set forth.

3. In a phonographic producer or reproducer, the combination with the diaphragm, of a retaining-ring for said diaphragm, a parallel motion pivoted to said ring, a lever pivoted to the member of the parallel motion opposite said ring, one end of said lever connected to the diaphragm and a stylus or a reproducing-point carried by said lever, substantially as set forth.

4. In a phonographic producer or reproducer, the combination with the diaphragm, of a weight having motion parallel thereto, a stylus or reproducer carrying said weight and means for connecting said stylus to the diaphragm, substantially as set forth.

5. In a phonographic producer or reproducer the combination with the diaphragm, of a weight adapted to have motion in parallel directions, a lever pivoted to and adapted to support said weight and connected to the dia-

phragm, and a stylus, or reproducing-point on said lever, substantially as set forth.

6. In a phonographic producer or reproducer, the combination with the casing, the diaphragm and its retaining-ring, of a parallel motion connected to said ring, a pair of perforated ears diametrically opposite on said ring, a recessed perforated bar, links pivoted to the ends of said bar and in the ears, a lever pivoted in the recess of said bar, a stylus or reproducer on said lever, and means for connecting the lever to the diaphragm, substantially as set forth.

7. In a phonographic producer or reproducer, the combination with the diaphragm, of a parallel motion, a stylus, a reproducing-point connected with said parallel motion, and means for adjusting said parallel motion to vary the pressure on the stylus or reproducing-point, substantially as set forth.

8. In a phonographic producer or reproducer, the combination with the revoluble cylinder, the diaphragm and a lever carrying the producing or reproducing point connected with said diaphragm; of a weight to which said lever is fulcrumed, and links pivotally connecting said weight with the diaphragm-support to form a parallelogram of levers, for the purpose set forth.

9. In a phonographic producer or reproducer, the combination with the revoluble cylinder, the diaphragm and a lever carrying the producing or reproducing point connected with said diaphragm; of a weight to which said lever is fulcrumed, and links pivotally connecting said weight with the diaphragm-support to form a parallelogram of levers, and means for varying the distance between the diaphragm and revoluble cylinder, for the purpose set forth.

10. In a phonographic producer or reproducer, the combination with the revoluble cylinder, the diaphragm, its holder and a two-armed lever to the longer arm of which said holder is secured, and an adjusting-screw impinging upon the short arm of such lever to prevent rotation on its fulcrum toward the cylinder; of a lever carrying the producing or reproducing point, connected with said diaphragm, a weight to which said lever is fulcrumed, said weight linked to the diaphragm-holder to form a parallelogram of levers, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

PHILIPP VON WOUWERMANS.

Witnesses:

MARTIN BERGHERBST,
CHAS. E. CARPENTER.



No. 646,370.

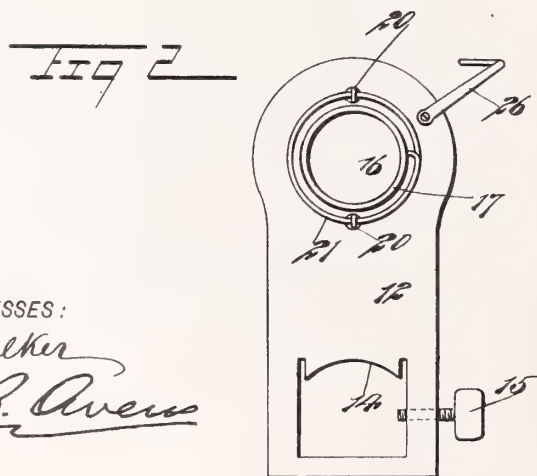
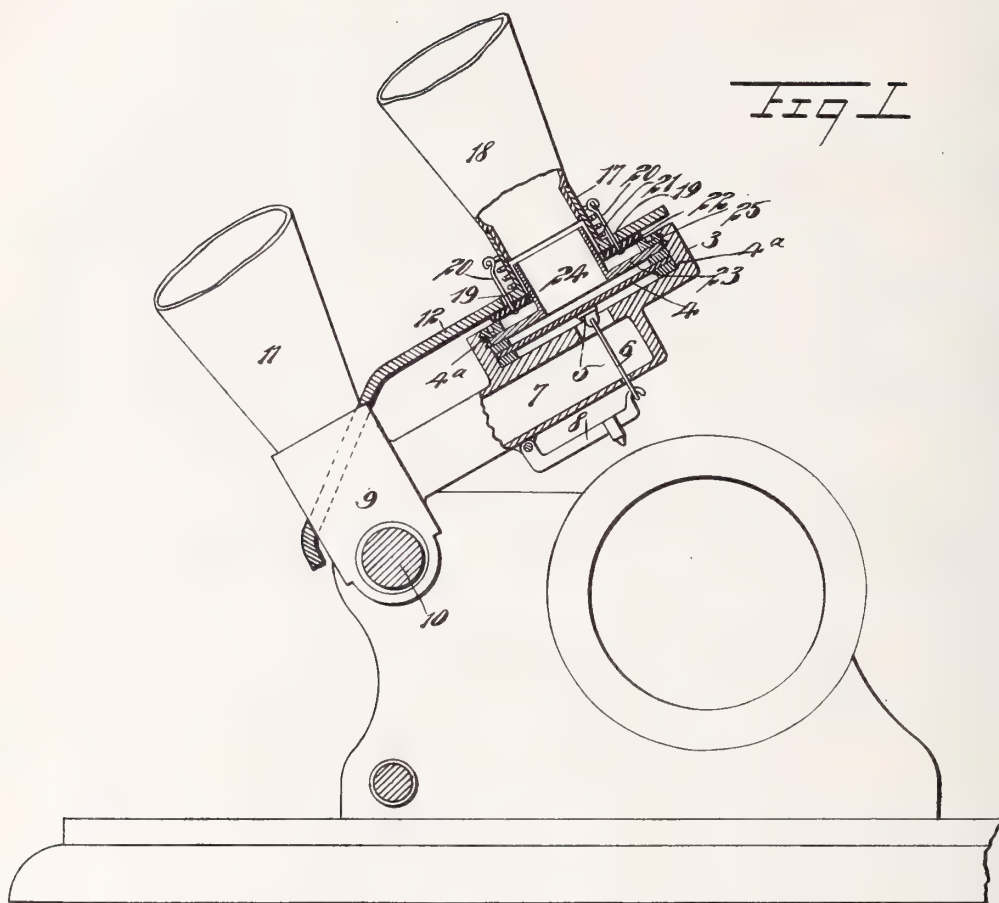
Patented Mar. 27, 1900.

F. W. NOLTE.
SOUND REPRODUCER.

(Application filed Feb. 20, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

H. Walker
John B. Owens

INVENTOR
Frederick W. Nolte
BY *[Signature]*

ATTORNEYS.



No. 646,370.

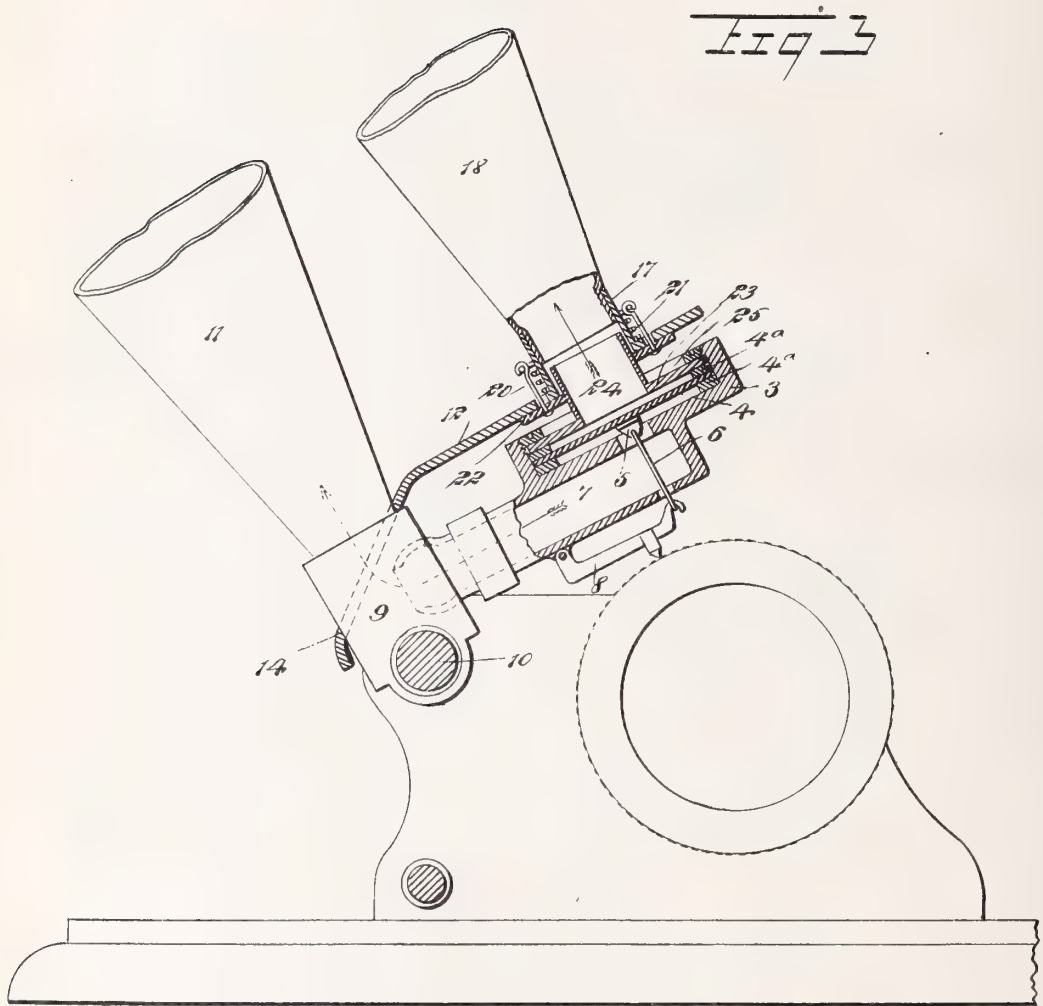
Patented Mar. 27, 1900.

F. W. NOLTE.
SOUND REPRODUCER.

(Application filed Feb. 20, 1899.)

(No Model.)

2 Sheets—Sheet 2



WITNESSES:

H. Walker
Isaac B. Owens

INVENTOR

F. W. Nolte
BY *Mumford*
ATTORNEYS

UNITED STATES PATENT OFFICE.

FREDERICK W. NOLTE, OF VICTORIA, BRITISH COLUMBIA, CANADA.

SOUND-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 646,370, dated March 27, 1900.

Application filed February 20, 1899. Serial No. 706,193. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK W. NOLTE, a citizen of the United States, residing in Victoria, in the Province of British Columbia and Dominion of Canada, have invented a new and Improved Sound-Reproducer, of which the following is a full, clear, and exact description.

The purpose of this invention is to provide for phonographs, graphophones, and like instruments in which a gravity-reproducer is used a reproducer by means of which the sound-waves may be taken from each side of the diaphragm in contradistinction to taking the sound-waves from only one side of the diaphragm.

This specification is the disclosure of one form of my invention, while the claims define the actual scope thereof.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is an end elevation showing a graphophone in outline and illustrating my invention in section, the parts being adjusted to be out of active position. Fig. 2 is a plan view showing the horn-holder; and Fig. 3 is a view similar to Fig. 1, except that the parts are shown in operative position.

The casing 3 of the reproducer contains the usual diaphragm 4. To this diaphragm a head 5 is attached, and this head in turn is connected with a wire 6, which passes through an opening in the bottom of the casing 3, and also transversely through a tube 7, which leads the sound-waves from the bottom of the diaphragm. The wire 6 is in connection with the free end of the reproducing-lever 8, the point of which bears on the cylinder of the graphophone, as usual. The tube 7 is mounted to swing on and communicate with the box 9 of the carriage of the apparatus, which is mounted to move along the shaft 10, all of which is in common use in the art. The box 9 is in communication with a horn 11, which horn serves to radiate the sound-waves which pass from the bottom of the diaphragm through the tube 7 to the box 9. A horn-holding plate or support 12 is provided with an opening 14, fitting around the box 9 in the manner shown. The plate 12 has a set-screw 15, whereby to fasten the plate rigidly to the

box. This plate 12 projects transversely over the casing 3 and is formed with an opening 16, (see Fig. 2,) which is surrounded by a perpendicularly-extending tube 17, fastened rigidly to the plate 12 and serving to carry the horn 18, which serves to radiate the sound-waves from the upper side of the diaphragm 4. The plate 12 is provided with two openings 19, located, respectively, on opposite sides of the tube 17. Through these openings 19 are passed pins 20, which are in connection with an expansive spiral spring 21, bearing on the plate 12 and surrounding the tube 17. Located on the under side of the plate 12 and attached to the pins 20 is a flat ring 22, which by means of the spring 21 is drawn into close contact with the under side of the plate 12.

Fastened in the casing 3 and over the diaphragm 4 is a circular plate 23, which has a central opening therein surrounded by an upwardly-extended tube 24. This tube 24 projects through ring 22 and the opening 16 in the plate 12 and upward into the tube 17, so that the sound-waves radiating from the upper side of the diaphragm may pass out through the tube 24 into the horn 18. The ring 22, fitting snugly around the tube 24, serves to prevent the escape of sound-waves between the tubes 17 and 24. At the same time the spring-mounting of the ring 22 allows the tube 24 free movement in a manner to be fully described hereinafter. Screwing into the upper side of the casing 3 is a ring-nut 25, which bears down on the plate 23 to hold the same rigidly in place, the diaphragm being sustained between two gaskets or spacing-rings 4^a, so that the diaphragm is held out of contact with the bottom of the casing 3 and with the plate 23, whereby to permit unrestrained vibration of the diaphragm. The plate 12 carries a swinging clamping-arm 26, which arm serves to engage the under side of the casing 3 to hold the casing raised against the plate 12 when the apparatus is not in use, as shown in Fig. 1.

The plate 12 being rigidly fastened on the box 9 of the carriage of the apparatus and supporting the horn 18 when the reproducer is not in use, the tube 7, with the casing 3 and the attached parts, should be moved up to the position shown in Fig. 1 and held in such position by the clamp 26, engaged with the parts 3 and 12, as shown. This raises the

stylus from the record, as the view illustrates. When it is desired to use the reproducer, the clamp 26 should be released, thus permitting the tube 7, with its attached parts, to drop and bear the stylus on the record, the stylus being pressed on the record by the whole weight of the casing 3 and the tube 7 and parts carried thereby. The diaphragm 4 being vibrated, the sound-waves will pass from each side of the diaphragm through the tubes 7 and 24, respectively. The ring 22, being very delicately sustained by the spring 21, does not in any way interfere with the free movement of the tube 24, which freedom of movement is necessary to the tube and the casing 3 thus to permit the proper action of the stylus on the record. After the operation has been completed the tube 7, with the attached casing, should again be raised to the position shown in Fig. 1 and held there by the clamp 26.

Having thus fully described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a talking-machine or like instrument, comprising a carriage and a tube mounted to swing thereon and communicating therewith, of a support rigidly attached to the carriage, a horn carried by the support, a casing held by the tube, and moving with the same, a diaphragm mounted in the casing, a reproducing-lever supported by the tube and having connection with the diaphragm at one side thereof, the tube conducting sound-waves from the said side of the diaphragm, a closure for the casing at the other side of the diaphragm, a tube supported by said closure and leading to the horn of the support to conduct the sound-waves from the other side of the diaphragm, and a clamp for joining the casing and support.

2. The combination, with a talking-machine or like instrument, comprising a carriage and a tube mounted to swing thereon and communicating therewith, of a casing attached to the tube and communicating therewith, a diaphragm mounted in the casing, the tube conducting the sound-waves from one side of the diaphragm, a reproducing-lever mounted on the tube and having connection with the diaphragm at the side adjacent to the tube, a closure for the casing at the other side of the diaphragm, a tube carried by the closure and leading the sound-waves from the other side of the diaphragm, a support mounted on the carriage, a horn held by the support, a ring sustained on the support encircling the tube of the closure, the said tube of the closure communicating with the horn of the support, and a clamp for joining the casing and support.

3. A talking-machine or like instrument, having a carriage supporting a horn and a tube mounted to swing on the carriage, the tube leading to the horn, a casing mounted on the tube, a diaphragm mounted in the casing, the tube conducting the sound-waves

from one side of the diaphragm, a stylus supported by the tube and having connection with the diaphragm, a closure for the casing at the side opposite the tube, a tube carried by the closure and conducting the sound-waves from the side of the diaphragm opposite the first-named tube, a support mounted on the carriage and overhanging the casing, and means carried by the support and communicating with the closure-tube for conducting the sound-waves from said tube.

4. A talking-machine having a carriage, means for conducting the sound-waves, such means being supported by the carriage, a tube mounted to swing on the carriage and communicating with said means, a support mounted on the carriage, a second means for conducting the sound-waves, such second means being carried by the support, a casing mounted on the tube, a diaphragm mounted in the casing, the said tube leading the sound-waves from one side of the diaphragm, a tube mounted at the other side of the diaphragm and leading the sound-waves therefrom into the said second means, and means for removably joining the casing with the support, to sustain the casing.

5. A talking-machine, or like instrument having a carriage, means mounted on the carriage for conducting the sound-waves therefrom, a support carried by the carriage, a second means mounted on the support for conducting the sound-waves, diaphragm devices mounted to swing on the carriage, the said means for conducting the sound-waves leading from the respective sides of the diaphragm, and means for removably connecting the diaphragm devices with the support.

6. The combination, with a talking-machine comprising a carriage and a tube mounted to swing thereon, of diaphragm devices carried by the tube and comprising a gravity-reproducer, the tube serving to conduct the sound-waves from the one side of the diaphragm, a support mounted independently of the diaphragm devices, and means for conducting the sound-waves from the other side of the diaphragm, such means being held by the said support.

7. In a talking-machine, the combination with a carriage and a tube mounted to swing thereon, of a horn mounted on the carriage and communicating with the tube, diaphragm devices held by the tube, the tube conducting the sound-waves from the lower side of the diaphragm, a support mounted on the carriage, a second horn held by the support and serving to conduct the sound-waves from the upper side of the diaphragm, and means for connecting the diaphragm devices and tube with the support to sustain said devices on the support.

FREDERICK W. NOLTE.

Witnesses:

ALEC MCCARTER,
SIDNEY W. SMITH.

No. 647,147.

Patented Apr. 10, 1900.

F. MYERS.
GRAPHOPHONE.

(Application filed Dec. 15, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

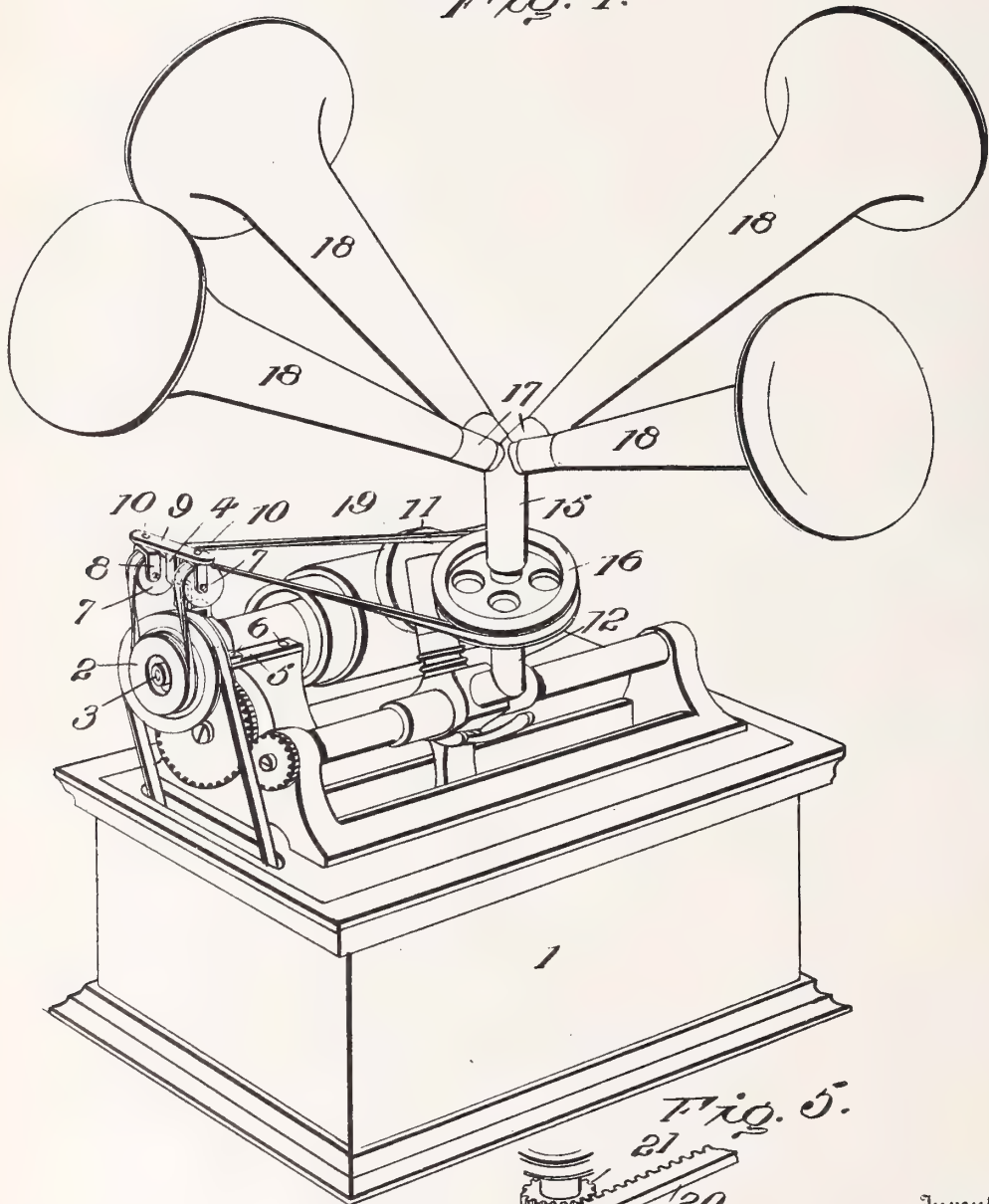
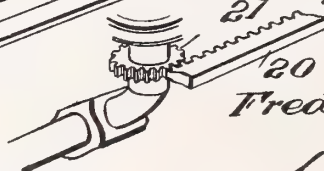


Fig. 5.



Witnesses

Jos. Imrie
J. J. Hartman

Inventor
Frederick Myers
by E. A. Barry & Co.,
his Attorney

No. 647,147.

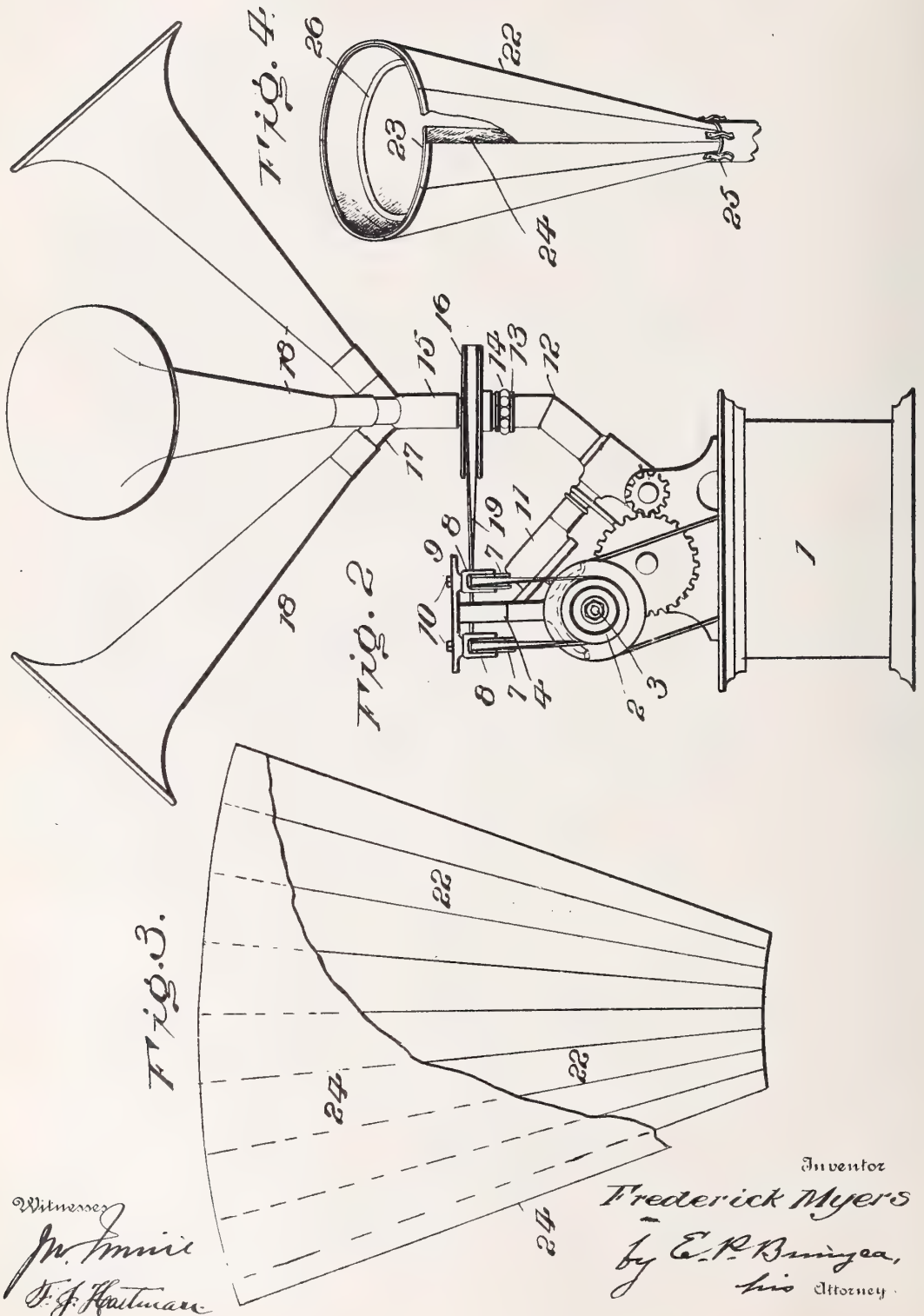
Patented Apr. 10, 1900.

F. MYERS.
GRAPHOPHONE.

(Application filed Dec. 15, 1899.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses
J. W. Miller
F. J. Hartman

Inventor
Frederick Myers
by E. R. Brinnea,
his Attorney.

UNITED STATES PATENT OFFICE.

FREDERICK MYERS, OF NEW YORK, N. Y.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 647,147, dated April 10, 1900.

Application filed December 15, 1899. Serial No. 740,481. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MYERS, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Sound Transmitters or Disseminators; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to sound transmitters or disseminators for phonographs, megaphones, and similar devices; and the objects of the same are to produce a device designed to be attached to any ordinary sound-producing instrument and which will project or disseminate the sound in all directions radially from the instrument.

The defects heretofore existing in sound-reproducing instruments of the class referred to are to a great extent due to the fact that the sound is usually projected in one direction only, and while the horn or tube through which the sound is transmitted may be adjusted to project the sound in any one direction persons sitting outside the range of the horn or tube do not get the full volume or force of the music or other reproduction.

By my invention the defects referred to are entirely remedied, as by its use an audience seated in a circle around the instrument can hear equally well, the reproduction being of the same volume and scope at all points from the instrument outward. I am also enabled to produce a peculiar and pleasing effect in certain classes of music to be reproduced, said effect consisting in giving a vibratory swell or variable sound-wave character to the music, owing to the revolution given to the transmitter horns or tubes. The usual metallic or grating sounds in phonographic reproductions are to a great extent absorbed and obviated by my invention, and certain classes of music are rendered in a greatly-modulated tone and in well-measured and uniform time, owing to the fact that the revolving horns act as a speed-regulator for

the instrument and at the same time distribute the sound equally at all points around the machine.

Figure 1 is a perspective view of a graphophone having my attachment connected thereto and showing four horns or transmitter-tubes. Fig. 2 is an end view of the same, three horns or tubes being shown. Fig. 3 is a plan view of a blank for one of the horns or tubes which I may use. Fig. 4 is a perspective view of a horn or tube made from said blank. Fig. 5 is a detail perspective of a modification in the means employed for actuating or revolving the horns or tubes.

Like numerals designate like parts wherever they occur in the different views.

Referring now to Figs. 1 and 2, the numeral 1 designates a graphophone of the well-known type. Beyond placing a small pulley 2 upon the end of the record-shaft 3 no alterations or changes are made in the structure of instruments of this character. A small upright bracket 4, having feet 5 attached by screws 6 to a permanent part of the instrument, serves as a support for two idlers 7, journaled in hangers 8, pivoted at the opposite ends of a cross-bar 9 upon the ends of the screws or bolts 10. To the usual short section of tubing projecting out from the lower portion of the reproducer 11 is a tubular elbow 12, having a flange 13 surrounding its vertical portion. This flange serves as a support for a ball-bearing 14 of suitable construction, said ball-bearing being attached to a tubular section 15, having a pulley 16 rigidly connected thereto. The upper end of the tubular section 15 has three or more radially-projecting tubular nipples 17, to which the horns or tubes 18 are connected. An elastic or india-rubber band 19 passes under the pulley 2, up and over the idlers 7, and around the pulley 16.

The operation of my invention as thus far described is as follows: The reproducer 11 having been set or placed in position to start at the beginning of the record-tube the starting-lever is moved to actuate the record-shaft 3. Motion is thus imparted to the pulley 2, around which the elastic band 19 passes, and from thence the revolution is communicated to the idlers 7 and to the pulley 16, with which

the horns or tubes 18 revolve. As the reproducer 11 moves from one end of the record-tube to the other to reproduce the piece of music or other record the elastic band 19 is elongated to the extent required, and the horns or tubes 18 are thus revolved during the entire time the shaft 2 revolves. The band 19 being small and quite elastic does not absorb but little power, and as the idlers 7 are journaled in swiveled hangers they turn to direct the elastic band in a straight line to the pulley 16 and create but little friction.

As shown in Fig. 5, a rack and pinion may be used for giving revolution to the horns. The rack 20 may be attached in any suitable manner to the casing of the instrument and supported at the required height to be engaged by a pinion 21 on the tube 15. As thus arranged when the reproducer moves from end to end of the record-tube the pinion 21 engages the rack 20 and the horns 18 are revolved.

It will be obvious from the foregoing that my attachment is quite simple and inexpensive, can be quickly applied to any sound-producing instrument of the class referred to, and will project the sound outward in all directions from the instrument. The horns or tubes being connected directly to the reproducer and extending radially outward have a tendency to give the entire force or volume to the production, even though the horns were permitted to remain stationary, and for some classes of music it is deemed equally as effective to permit the horns to remain stationary by throwing the elastic band 19 off the pulley 16. Again, for certain productions I have found that a single horn if revolved will give a peculiar combined modulated and swelling effect. When stationary, I have found that at least three horns are necessary to give good results and to project the sound equally from the instrument outward.

As shown in Figs. 3 and 4, the horn or tube which I may use is made of cardboard or similar light and durable material, and such tubes may be made to occupy but little space in shipping and at the same time be inexpensive and very efficient in use. When thus made, I take a piece of cardboard and score or crease it at intervals, or a sufficient number of strips 22 of cardboard or similar material and lay them edge to edge and attach to one or both faces thereof a piece of textile fabric 23, permitting one edge 24 of the fabric to project beyond the outer strip of the series. This edge may be ready gummed, so that the tube can be readily finished by moistening the gummed edge and attaching it to the opposite edge to complete the tube, or I may use other means for securing the edges. These tubes may thus be shipped flat or folded and can be easily made up by the purchaser. To make the tubes easily attach-

able to the reproducer-nipples any suitable number of spring-fingers 25 may be connected to the small end of the tube, and a wire ring 26 may be inserted into the large end of the tube to give the necessary strength to the device, or I may use a flat or flanged ring for the end of the tube. Tubes made in this way may have a coating of aluminium paint or bronze to give them a metallic luster.

I have found that tubes or horns made of a non-metallic material have a tendency to obviate the screeching sound so common in phonographs, and, besides, their lightness in weight makes them particularly desirable for my purpose.

Certain changes in the details of construction may be resorted to without departing from the spirit and scope of my invention. Hence I do not wish to be understood as being restricted to the details shown and described.

I claim—

1. In a sound-reproducing instrument, a sound-producer, a horn or tube connected to said producer, and means for revolving said horn or tube during the operation of the instrument.

2. In a sound-reproducing instrument, a sound-reproducer, a plurality of horns attached thereto, and means for revolving said horns during the operation of the instrument.

3. An attachment for sound-reproducing instruments, comprising a plurality of horns connected to a tubular section, and means for revolving said tubular section.

4. In a sound-reproducing instrument, a tubular section, a pulley secured thereto, a plurality of horns attached to said tubular section, a belt or band passing around the pulley and around a pulley revolved from the record-shaft.

5. In a sound-reproducing instrument, a plurality of horns secured to a hollow tubular section and projecting outward and upward from the upper end thereof, hollow connections from said tubular section to the reproducer, and means for revolving said tubular section.

6. In a sound-reproducing instrument, a tubular section having a plurality of horns projecting radially from its upper end, a pulley on said tubular section, a rubber band passing around said pulley and around idlers revolved from the record-shaft, and means for revolving the pulley, substantially as described.

7. In a sound-reproducing instrument, a reproducer, a tubular elbow attached to the nipple of said reproducer, a tubular section connected to said elbow, and a plurality of horns extending radially outward from said tubular section, and means for revolving the tubular section during the operation of the instrument.

8. In a sound-reproducing instrument, a reproducer, a tubular elbow connected to

said reproducer, said elbow having a vertically-disposed member, a tubular section connected to said vertical member, a plurality of horns extending radially outward from
5 said tubular section, and means for revolving said tubular section during the operation of the instrument.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK MYERS.

Witnesses:

FRANCIS C. NYE,
JOS. H. S. THOMAS.

For patent No. 647,503 to Thomas H. Macdonald, issued April 17, 1900 for Speed Regulator, see the last patent in this Volume.

No. 648,406.

Patented May 1, 1900.

W. HART.
GRAPHOPHONE REPRODUCER.

(Application filed June 14, 1898.)

(No Model.)

Fig. 1.

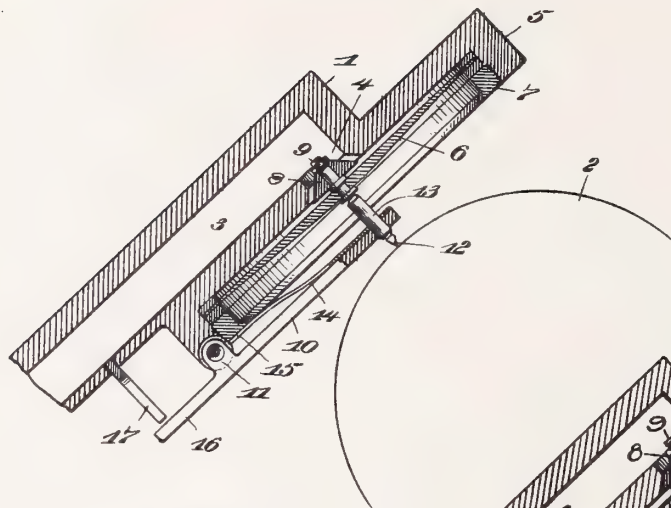


Fig. 5.

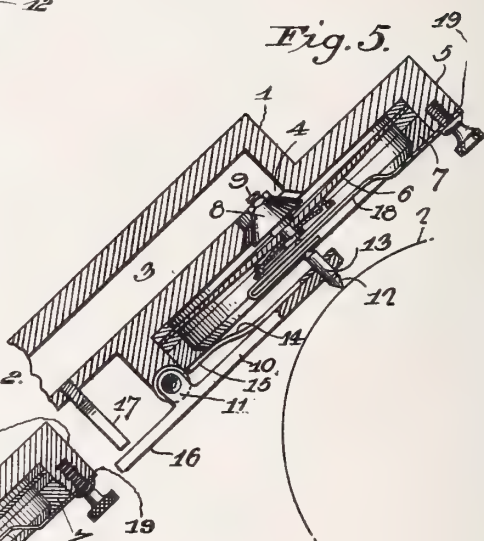


Fig. 4.

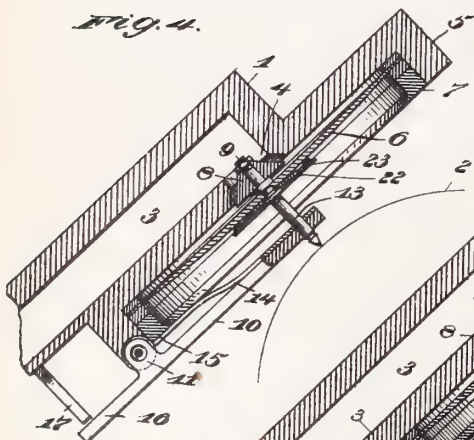


Fig. 2.

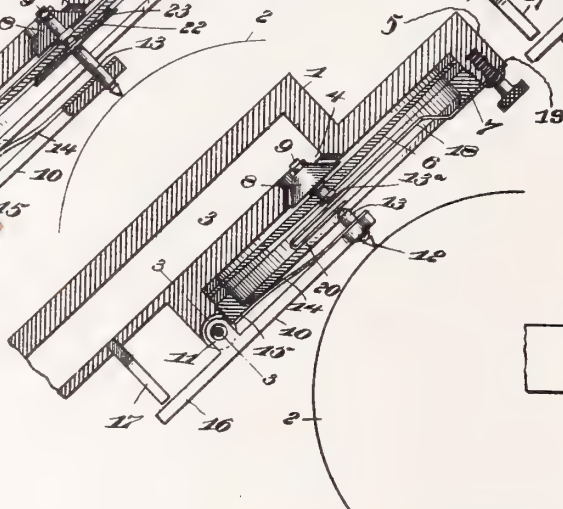
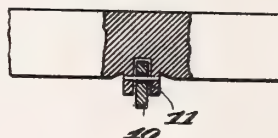


Fig. 3.



Witnesses

Wm. D. Day

J. H. Hallam

William Hart, Inventor

By - his - Attorneys,

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

WILLIAM HART, OF KIRKSVILLE, MISSOURI.

GRAPHOPHONE-REPRODUCER.

SPECIFICATION forming part of Letters Patent No. 648,406, dated May 1, 1900.

Application filed June 14, 1898. Serial No. 683,419. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HART, a citizen of the United States, residing at Kirksville, in the county of Adair and State of Missouri, have invented a new and useful Graphophone-Reproducer, of which the following is a specification.

This invention relates to reproducers for graphophones and similar instruments; and it has for its object to provide an improved form of diaphragm and novel means for transmitting the record of the phonogram or record-tablet to the diaphragm, whereby the said diaphragm will sensitively and accurately reproduce the record without the disagreeable sounds which are common to most of the reproducing devices now used in connection with graphophones, phonographs, and the like.

The invention also has for its object improved means which shall insure a greater amplitude of vibration and a louder sound than found in other types of reproducing devices or instruments.

With this object in view the invention consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a longitudinal sectional view of a reproducer for graphophones fitted with the improvements contemplated by the present invention and showing in diagram the phonogram or record-cylinder. Fig. 2 is a view similar to Fig. 1, showing a mute spring or plate interposed between the transmitting point or stud and the diaphragm. Fig. 3 is a detail sectional view showing the pivotal connection for the stylus-arm. Fig. 4 is a sectional view similar to Fig. 1, showing the use of a tension plate or disk in connection with the vibratory diaphragm. Fig. 5 is a sectional view showing a modification.

Referring to the accompanying drawings, the numeral 1 designates the tubular reproducing head or casing of the ordinary form and designed to be mounted in the usual manner in an operative position with relation to the phonogram or record-cylinder 2; but as these features form no part of the present invention the framework and supports for the head or casing and for the phonogram or record-cylinder are not shown in the drawings.

The tubular reproducing head or casing 1 is provided with the usual longitudinal sound-passage 3, which communicates at one end with the ordinary "horn" or "ear-tubes" and at its other end opens into the central orifice 4, formed at the center of the diaphragm-cup 5. The diaphragm-cup 5 is formed at one side of the head or casing 1 and receives therein the vibratory diaphragm 6, which is held in place within the cup by means of the usual clamping-ring 7, having a threaded engagement with the inner wall of the cup and binding on the peripheral edge of the diaphragm, whereby the major portion of said diaphragm is permitted to have a free and unobstructed vibration within the cup to provide for forcing the sound-waves through the orifice 4 and the passage 3, communicating therewith.

The diaphragm 6 is made of any material suitable for the purpose; but in the present invention the said diaphragm 6 tapers in thickness toward its periphery, whereby the same will be thickest at its center and thinnest at its periphery, and therefore most sensitive at the latter point. By reason of constructing the diaphragm of a tapering thickness a greater amplitude of vibration is produced than by the use of a diaphragm of uniform thickness throughout, and a greater volume of sound is necessarily caused to pass out of the reproducing head or casing.

In connection with the diaphragm 6 of tapering thickness there is preferably employed a separate weight 8, which is arranged at one side of the diaphragm, preferably the inner side, and centrally thereof, so as to lie within the orifice 4 of the head or casing. This weight is designed to move in unison with the diaphragm and is rigidly connected thereto by means of a bolt or similar fastening 9, and according to the size of the said weight 8 the amplitude of vibration of the diaphragm will be correspondingly increased or diminished.

To provide for transmitting the record to the diaphragm, there is employed a pivotal stylus-arm 10, which arm is pivoted intermediate its ends, as at 11, to one side of the diaphragm-cup 5, and the hole or opening in the said arm 10 which receives the pivot-pin is broached out slightly from each side with a tapering broach, thereby giving a slight lat-

eral play to the arm in either direction, so that the stylus or reproducing-point 12 can readily adjust itself to the irregularities of the record in the phonogram-blank or record-cylinder 2. The stylus or reproducing-point 12 is projected from the outer side of the arm 10 and one end thereof and is arranged directly opposite the inwardly-projecting transmitting point or stud 13, which in the construction shown in Fig. 1 works against the outer side of the diaphragm at the center thereof to provide for transmitting the record thereto. A pressure-spring 14 is secured fast at one end to the inner side of the arm 10 and has its free end bearing against a shoulder 15, adjacent to the pivot of the arm, to provide for exerting sufficient pressure on the stylus-arm to hold the stylus or reproducing-point in firm contact with the phonogram or record-cylinder and to prevent the same from jolting out of place while also easing up the weight on the diaphragm.

At one side of its pivot the stylus-arm 10 is extended, as at 16, and said extension is designed to pass into a holding or guiding fork 17, projected from one side of the head or casing 1 below the cup thereof. This movement of the arm extension 16 into the fork 17 occurs when the entire reproducing device is lifted from the phonogram or record-cylinder. The function of the fork 17 is to hold the arm 10 perfectly straight and in proper position for the stylus thereof to engage with the surface of the record when the device is again lowered to an operative position.

When the ear-tubes are employed instead of the horn, it is desirable to reduce the intensity of the sound, and to accomplish this result I employ a mute spring or plate 18. (See Fig. 2 of the drawings.) This mute spring or plate 18 is arranged at the outer side of the diaphragm and is fastened rigidly at one end, as at 19, to one end of the head or casing 1, the other end of said spring or plate being folded upon itself, as at 20, and interposed between the transmitting point or stud 13 and the central portion of the diaphragm, and on its inner face the said mute spring or plate is provided with a supplemental transmitting-point 13^a, which contacts with the diaphragm. The folded end 20 of the mute spring or plate serves to take up or ease the positive action of the stylus-arm, and thereby impart a gentle vibration to the diaphragm.

To provide for further increasing the distinctness and force of the sound, the central portion of the diaphragm 6 may be stiffened or tightened by the use of a supplemental tension plate or disk 22. (Shown in Fig. 4 of the drawings.) This tension plate or disk 22 is formed of a thin plate of spring metal and is provided at one side with a plurality of contact studs or projections 23, adapted to press against the adjacent face or side of the diaphragm 6. In using the tension plate or disk 22 as a part of the reproducer the dia-

phragm 6 may or may not be of a tapering thickness, and said plate or disk 22 is preferably held in place by means of the bolt or fastening 9 for the weight 8, although it will be understood that in the event of the plate or disk being used with the diaphragm without the weight a similar bolt or fastening may be utilized to provide connection between the plate or disk and the diaphragm. When the weight 8 is not used, the tension plate or disk may obviously be arranged at either side of the diaphragm 6; but the preferable arrangement of the plate or disk 22 is at the outer side of the diaphragm, as shown in Fig. 4 of the drawings, and it will further be observed that when the bolt or fastening 9, which passes through the center of the plate or disk 22 and the diaphragm, is tightened up the studs or projections 23 will cause both the diaphragm and the tension plate or disk to bulge slightly into a concavo-convex form, thereby stiffening or tightening up the central portion of the diaphragm, and necessarily increasing its sensitiveness and accuracy of reproduction. While the tension plate or disk 22 serves to stiffen or tighten the central portion of the diaphragm, the said plate or disk also places a tension on the entire diaphragm.

From the foregoing it is thought that the construction and use of the improvements herein described will be readily apparent to those skilled in the art without further description, and it will be understood that various changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Fig. 5 shows a modification of structure in which the spring 18 is employed intermediate the stud 13 and the extension plate or disk 22 and for the same purpose as employed in the structure shown and described in Fig. 2 of the drawings.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is—

1. In a graphophone-reproducer, the combination of a casing, a vibratory diaphragm in the casing, a stylus-arm pivotally connected with the casing and carrying at one end a stylus in axial alinement with the diaphragm, a stud in axial alinement with the stylus and diaphragm and in operative relation with the latter and adapted to move radially thereof and to convey motion from the stylus to the diaphragm, and a spring adapted to normally exert an outward pressure on the stylus.

2. In a graphophone-reproducer, the head or casing, the diaphragm, a stylus-arm pivoted intermediate its ends on the head or casing and capable of a slight lateral play, said arm having an extension at one end and carrying at its other end a stylus, and an oppositely-extending transmitting point or stud in operative relation to the diaphragm, and a

holding or guiding fork arranged adjacent to and adapted to receive said arm extension, substantially as set forth.

3. In a graphophone-reproducer, the head
5 or casing, the diaphragm, the stylus-arm carrying a transmitting-point having no positive connection with the diaphragm, and a mute spring or plate having a supplemental transmitting-point and interposed directly between
10 the diaphragm and the active end of the point carried by the stylus-arm, substantially as set forth.

4. In a graphophone-reproducer, the head or casing, the diaphragm, the stylus-arm carrying a transmitting-point, and a mute spring or plate having a folded end interposed between said point and the diaphragm, substantially as set forth.

5. In a graphophone-reproducer, the head
20 or casing, the diaphragm, a spring-metal tension plate or disk arranged at one side of the diaphragm and provided with a plurality of

contact studs or projections adapted to press directly thereagainst, a fastening connection between the center of said plate or disk and
25 the diaphragm and adapted to exert pressure between the diaphragm and the studs on the plate to dish the diaphragm and vary its tension, and the reproducing stylus or point, substantially as set forth.

6. In a graphophone-reproducer, the combination with the diaphragm, of a rigid tension-plate having portions extended beyond a face thereof, said portions having direct contact with the diaphragm at one side thereof,
35 and means for dishing the diaphragm intermediate said projections to vary its tension.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM HART.

Witnesses:

CHAS. S. SANDS,
B. M. SANDS.



No. 648,659.

Patented May 1, 1900.

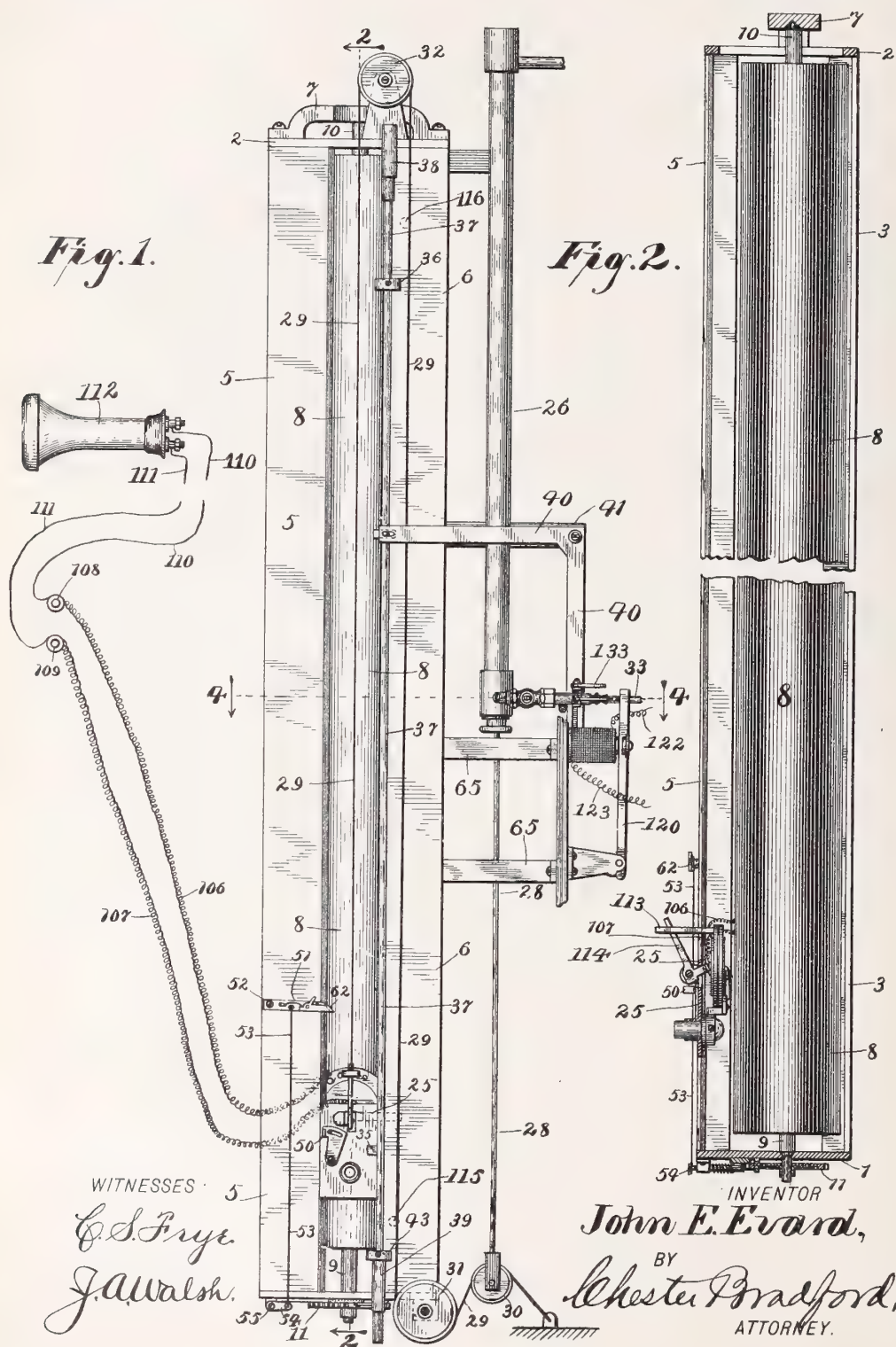
J. E. EVARD.

PHONOGRAPHO-TELEPHONIC ANNOUNCER.

(Application filed July 8, 1898.)

(No Model.)

5 Sheets—Sheet 1.



No. 648,659.

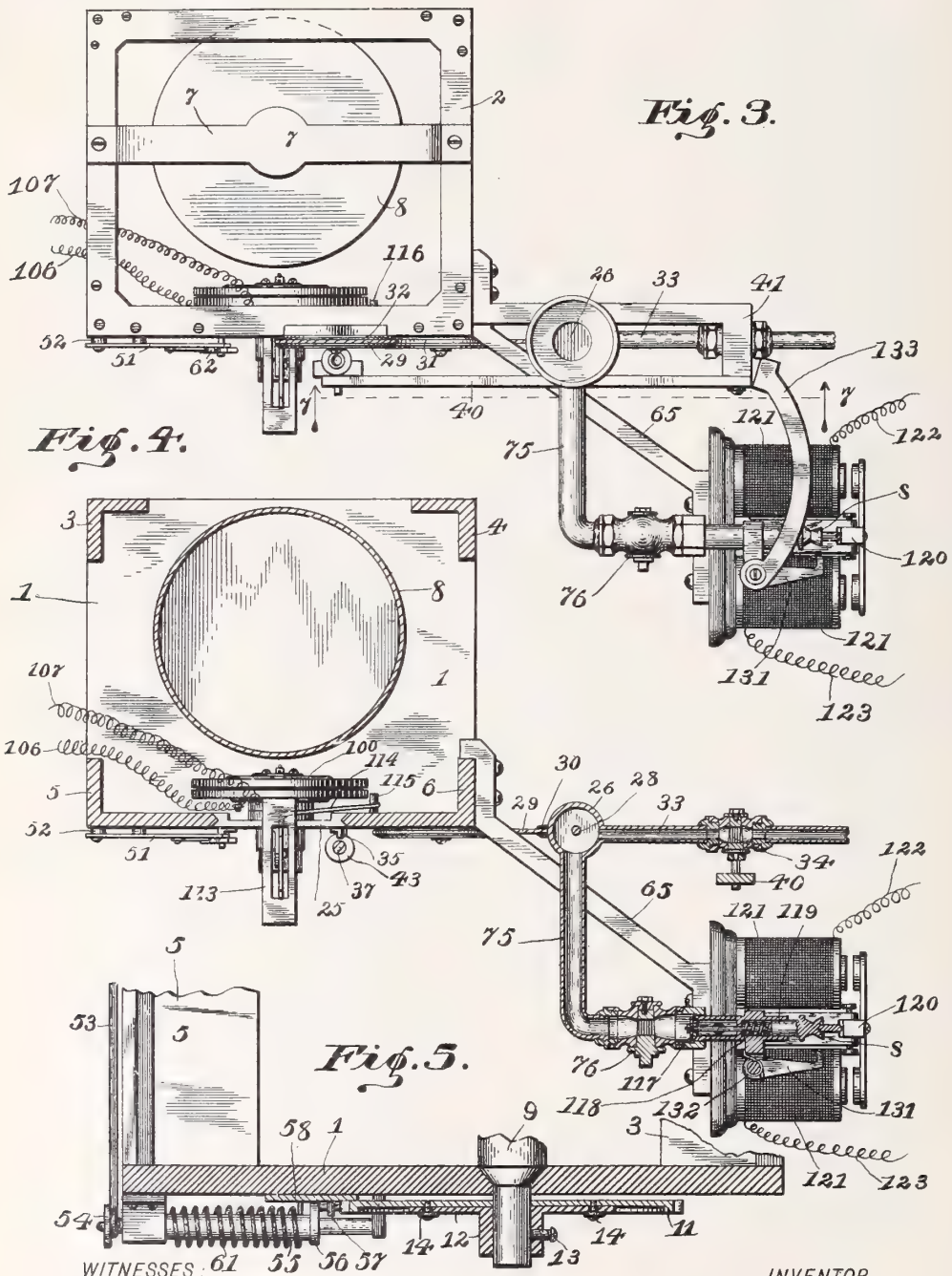
Patented May 1, 1900.

J. E. EVARD.
PHONOGRAPHO-TELEPHONIC ANNOUNCER.

(No Model.)

(Application filed July 8, 1898.)

5 Sheets—Sheet 2.



WITNESSES:
G. S. Frye.
J. A. Walsh.

INVENTOR
John E. Evard,
BY
Chester Bradford,
ATTORNEY.

PHONOGRAPH-TELEPHONIC ANNOUNCER.

(Application filed July 8, 1908.)

(No Model.)

5 Sheets—Sheet 3.

Fig. 6.

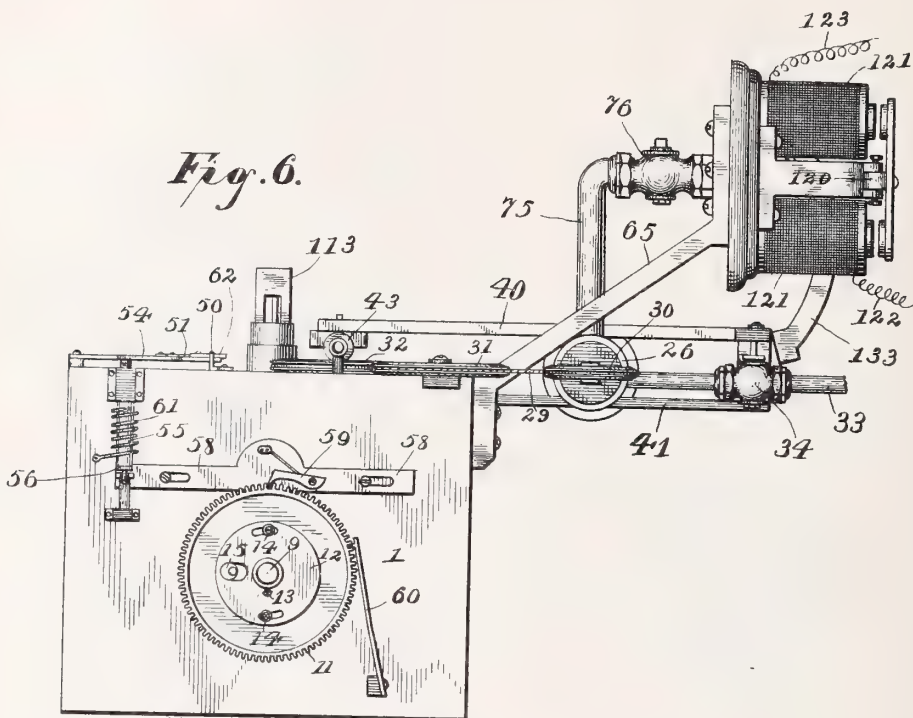
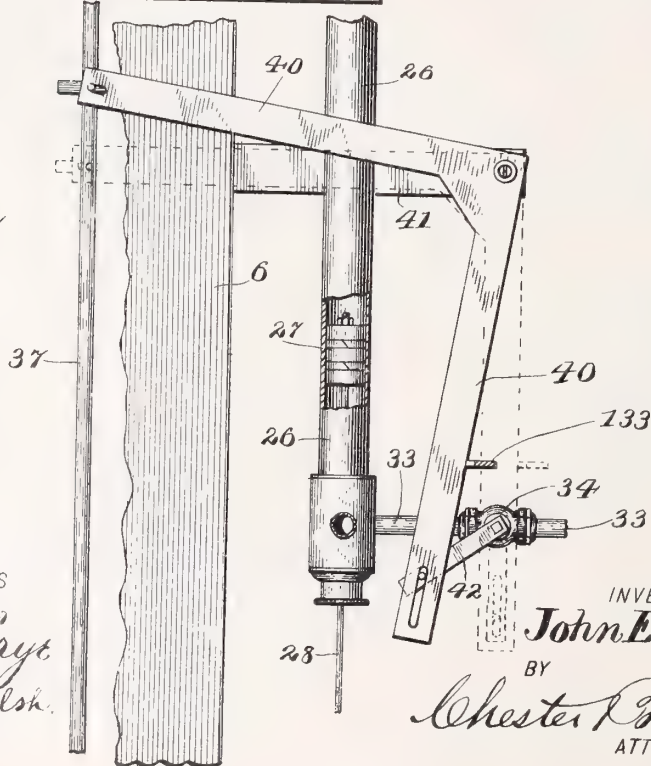


Fig. 7.



WITNESSES

C. S. Frye
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INVENTOR

John E. Evard,

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Chester Bradford,
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J. E. EVARD.

PHONOGRAPHO-TELEPHONIC ANNOUNCER.

(Application filed July 8, 1898.)

(No Model.)

5 Sheets—Sheet 4.

Fig. 8.

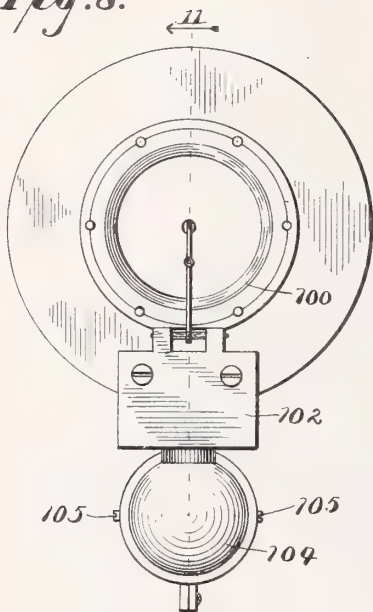


Fig. 9.

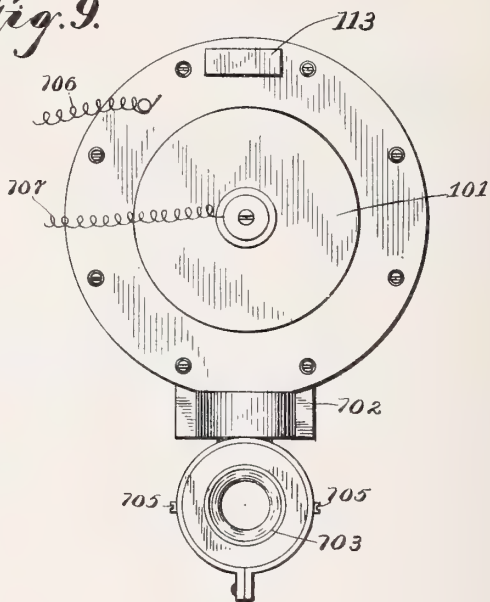


Fig. 11.

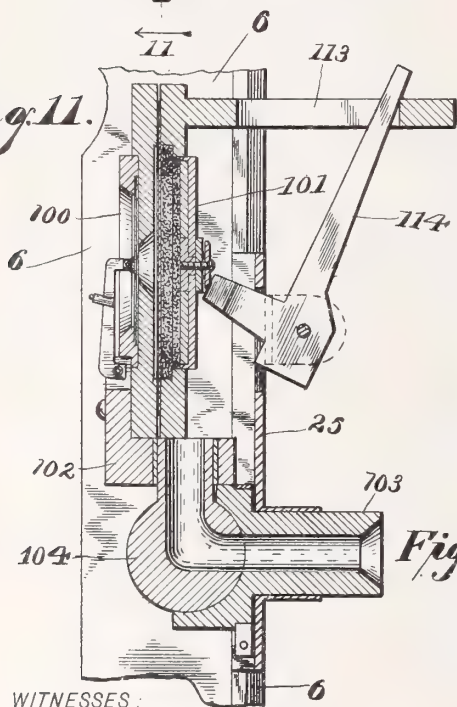


Fig. 10.

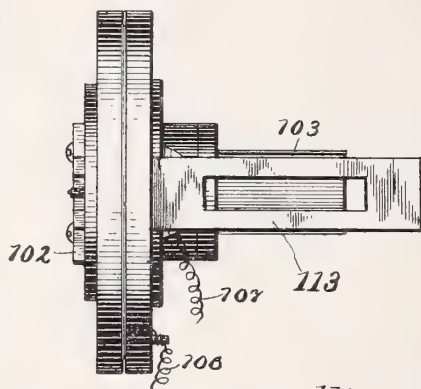
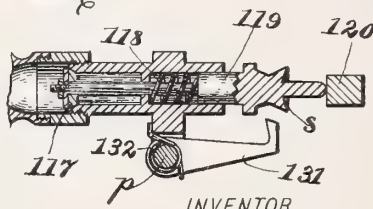


Fig. 12.



WITNESSES:

C. S. Frye.
J. A. Walsh.

INVENTOR

John E. Eward,
BY
Chester Bradford,
ATTORNEY.

No. 648,659.

Patented May 1, 1900.

J. E. EVARD.
PHONOGRAPH-TELEPHONIC ANNOUNCER.

(Application filed July 8, 1898.)

(No Model.)

5 Sheets—Sheet 5.

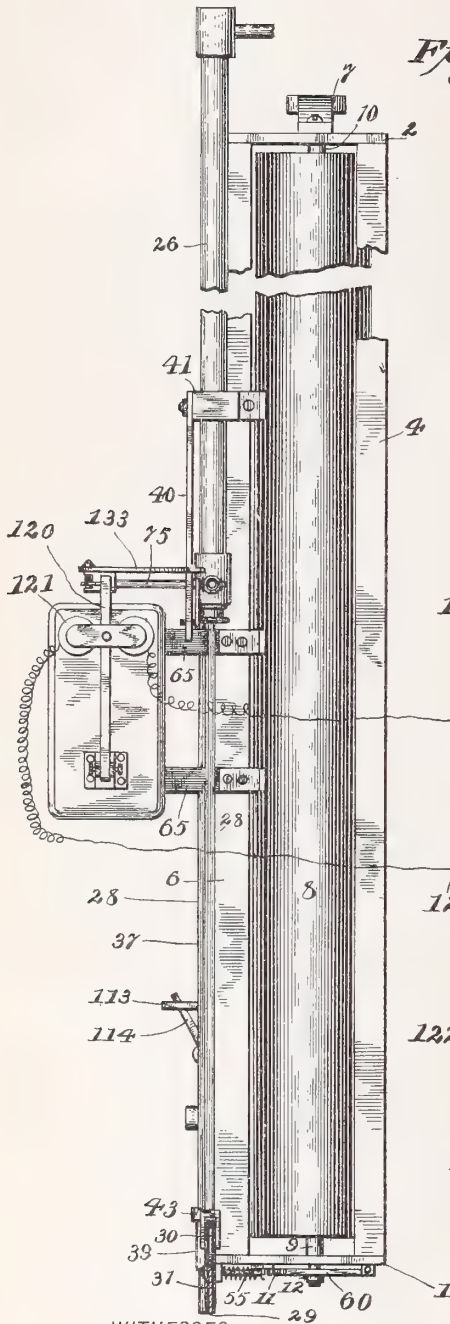


Fig. 13.

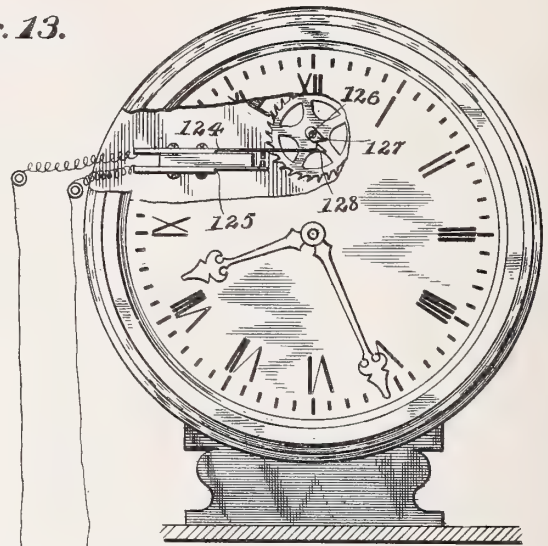
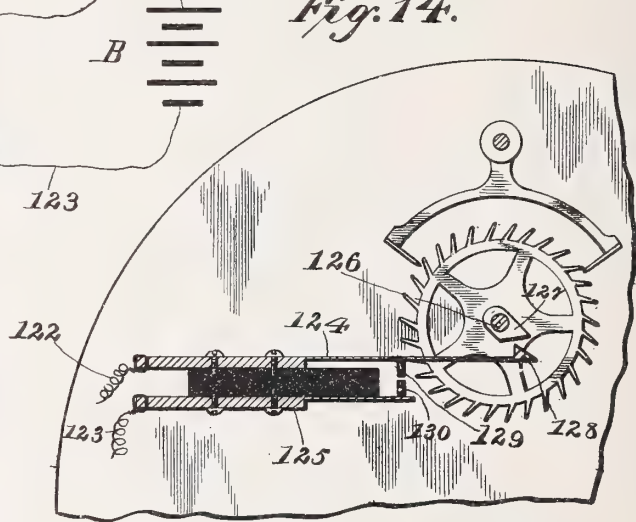


Fig. 14.



WITNESSES:

C. S. Pye.
J. A. Walsh.

INVENTOR

John E. Evard,

BY

Chester Bradford,
ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN E. EVARD, OF INDIANAPOLIS, INDIANA, ASSIGNOR OF ONE-HALF TO
ARTHUR A. MCKAIN, OF SAME PLACE.

PHONOGRAPHO-TELEPHONIC ANNOUNCER.

SPECIFICATION forming part of Letters Patent No. 648,659, dated May 1, 1900.

Application filed July 8, 1898. Serial No. 685,427. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. EVARD, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Phonographo-Telephonic Announcers, of which the following is a specification.

The object of my said invention is to provide a means whereby persons having telephones may at any and all times be enabled to listen to a phonographic announcement of any given fact, my especial object being to enable telephone subscribers to ascertain the correct time whenever they desire.

This invention may obviously, also, be utilized in the dissemination of other information upon making suitable modifications in the construction and arrangement of the instrument to adapt it to the particular use required. I will, however, illustrate and describe only the form of instrument which I have designed for the purpose of telling the time, which consists, generally speaking, in a phonographic record-bearer (cylinder) inscribed with sentences telling the various times of day, preferably one for each minute during the twelve hours, which constitute the ordinary period in which the hour-hand of a timepiece makes a complete revolution; a phonographic reproducer adapted to travel over said cylinder; a telephonic transmitter coupled to said phonographic reproducer; suitable means for propelling this combined structure in relation to the cylinder; a timepiece and a connection between said propelling means and said timepiece whereby the former are caused to be operated or released according to the arrangement adopted each time the timepiece arrived at a predetermined point in its revolution, preferably, as above stated, at the end of each minute of time. In a general way the operation is that the time of day will be spoken into any telephone which is connected to the circuit in which the telephonic transmitter is placed, so that the user of any such telephone may by listening hear the time plainly spoken at any minute throughout the day.

The invention further consists in various details of construction and arrangements of

parts whereby the objects above indicated are carried out, all as will be hereinafter more particularly described and claimed.

Referring to the accompanying drawings, 55 which are made a part hereof, and on which similar letters and numerals of reference indicate similar parts, Figure 1 is a front elevation of an apparatus embodying my present invention; Fig. 2, a sectional view of the same as 60 seen when looking in the direction indicated by the arrows from the dotted line 2 2 in Fig. 1; Fig. 3, a top or plan view, on an enlarged scale, of said apparatus; Fig. 4, a horizontal sectional view looking downwardly from the 65 dotted line 4 4 in Fig. 1; Fig. 5, a detail sectional view, on a still further enlarged scale, through the bottom end of the apparatus, being similar to the extreme lower portion of Fig. 2; Fig. 6, an under side plan view of the 70 apparatus on the same scale as Figs. 3 and 4; Fig. 7, a detail elevation as seen from the dotted line 7 7 in Fig. 3; Fig. 8, a view of the combined phonographic reproducer and telephonic transmitter as seen from the repro- 75 ducer side; Fig. 9, a view of the same as seen from the transmitter side; Fig. 10, a top or plan view of the same; Fig. 11, a central sectional view thereof and of the adjacent parts as seen from the dotted line 11 11 in Fig. 8; 80 Fig. 12, a view similar to a portion of Fig. 4, but on a somewhat-enlarged scale, showing the construction and arrangement of the fluid-discharging valve more plainly; Fig. 13, a side elevation of the apparatus, including 85 the timepiece by which its operation is controlled; and Fig. 14 a detail view showing the contact-maker operated by the timepiece more plainly.

This apparatus is of considerable length 90 and is mounted in a suitable framework. I have shown such framework as mainly composed of a bottom plate 1, an upper rectangular frame part 2, and four angle-piece corners 3, 4, 5, and 6. A removable bridge-tree 95 7 extends across the part 2 and serves to carry the bearing for the upper end of the cylinder or cylinder-shaft. The outer portion of the cylinder bearing the inscriptions needs to be renewed from time to time as the inscriptions 100 become imperfectly distinguishable because of wear, and this can readily be done by re-

moving the bridge-tree 7, which leaves a free opening through the upper end of the frame, through which such cylinder portions can be removed and replaced or renewed.

5 The cylinder 8, which bears the records or inscriptions, is provided with shafts or shaft ends 9 and 10, which rest in suitable bearings in the plate 1 and in the bridge-tree 7. Said bearings are preferably of a conical form, as
10 bearings of this form secure the part carried thereby more accurately and steadily in place than most other forms. Said bearings are best shown in Figs. 2 and 5. Upon the lower end of the shaft or shaft end 9 is a toothed
15 wheel 11, by which the cylinder is revolved, as will be presently described. Said wheel is made in two parts, and the toothed main portion 11, which is substantially a circular rack, is capable of being shifted somewhat
20 upon the hub 12, the latter being held fixedly to the shaft 9 by a set-screw 13 or an equivalent spline, while the former is loose upon the shaft and secured to the hub by clamping-screws 14, which preferably pass through
25 curved slots therein, as shown in Fig. 6. When it is desired to shift the cylinder slightly in its relation to the feeding apparatus, it is done by loosening the clamping-screws 14, turning the wheel or rack 11
30 slightly, preferably by means of the eccentric 15, and retightening the clamping-screws. As will be readily understood, it is of considerable importance that the adjustment of this cylinder should be very exact in order to
35 bring the inscription-lines on the cylinder into accurate engagement with the point on the phonographic reproducer, and these adjusting means are therefore provided. The eccentric 15 (see Fig. 6) is mounted in the
40 flange of the hub 12 on a stud extending out from the web of the toothed main portion 11, so that any rotation of said eccentric will shift the relations of said parts 11 and 12, as will be readily understood.

45 Referring now especially to Figs. 1, 2, and 4, it will be seen that the carriage 25 is mounted between the frame parts 5 and 6, the facing sides whereof are formed in the A-shaped ways, over which V-shaped grooves
50 on the sides of the carriage 25 snugly fit. This carriage carries the phonographic reproducer and telephonic transmitter up and down the machine, the message being transmitted during the descent from the top to the
55 bottom. Manifestly numerous devices may be designed to operate to raise this carriage, while its own gravity may be utilized to cause it to descend. The means which I have provided and prefer for raising it consists of a
60 cylinder 26, in which is a piston 27, which is adapted to operate the piston-rod 28, which (either directly or through a suitable cord 29 and pulleys 30, 31, and 32) is connected to said carriage 25. Said piston is adapted to operate
65 by a fluid-pressure connected to any suitable source of supply by a pipe 33, the supply being adapted to be shut off at intervals by a

valve or cock 34, the operation of which will be hereinafter described. When the fluid-pressure is turned on, the piston is driven up
70 the cylinder 26, and through the piston-rod 28 and cord 29 raises the carriage 25 and the parts carried thereby. As said carriage ascends a projection 35 comes in contact with
75 a collar 36 on a rod 37, which rod is loosely mounted in bearings 38 and 39 on the framework and raises said rod in its said bearings. Said rod is connected to a bell-crank lever
80 40, which is pivoted on an arm 41, extending out from the framework, and said bell-crank lever is, as best shown in Fig. 7, connected to an arm 42 on the cock 34, so that as said carriage 25 reaches the upper end of its travel
85 it operates to shut off the fluid-pressure on the piston 27 in the cylinder 26, thus terminating the travel of said carriage at any predetermined point, the collar 36 being adjustable by means of a set-screw, as shown. The carriage remains in its elevated position until
90 the moment of time arrives at which the message is to be transmitted. The timepiece, as will be hereinafter more fully described, when it arrives at that point closes a circuit and electrically energizes a magnet, (shown as carried by arms 65 on the frame,) and said mag-
95 net operates to open a discharge-valve, when the fluid escapes from the cylinder and permits the piston to descend, and consequently permits the carriage 25 to descend, and during the descent the message is transmitted. When
100 the carriage 25 reaches the lower end of its course, the projection 35 thereon strikes a collar 43, pulling down the rod 37, and through the bell-crank lever 40 opening the valve or cock 34, whereupon under the influence of
105 the renewed fluid-pressure the piston begins to reascend. In this way this operation is continuously repeated. Instantly when the carriage reaches the bottom of its travel it throws on the fluid-pressure, whereby said
110 carriage is raised until it reaches its uppermost position, where it remains until the instant of time is reached by which the magnet is energized and the escape-valve opened. The period during which the carriage remains
115 stationary is therefore always while it is positioned at that point on the machine corresponding to the beginning of the inscription in the arrangement shown at the upper end. Shortly after the carriage 25 begins to ascend
120 a projection 50 thereon strikes the arm 51, which is pivoted to the frame member 5 by a pivot 52. Said arm 51 is connected by means of a rod, wire, or rope 53 to an arm 54 on the rock-shaft 55, and thus said rock-shaft is oper-
125 ated. Upon the inner end of said rock-shaft there is a crank 56, which engages with a projection 57 on the reciprocating pawl-carrying plate 58. A pawl 59 on said plate engages with the teeth of the wheel or rack
130 11, and thus said wheel or rack is moved the required distance at each ascent of the carriage 25. A spring-dog 60, the projection or point whereon is wedge-shaped and fits closely

between any two of the teeth on wheel 11, stops said wheel at an exact point in each case and prevents any looseness or play thereof. The rock-shaft 55 is operated reversely to the pull of the rod 53 by a spring 61. The contact end 62 of the arm 51 is pivoted and adapted to move freely on said pivot in a downward direction, so that the carriage 25 as it descends has no effect upon the rock-shaft.

The cylinder 26, as hereinbefore stated, is supplied by a supply-pipe 33, the cock 34 of which is controlled in the manner elsewhere described. It is of course necessary to provide also an egress-pipe through which the fluid may escape while the carriage is descending. I therefore provide for this purpose the fluid-escape pipe 75, in which I prefer to place the ordinary shut-off valve or cock 76. In the active operation of my apparatus, however, this cock or valve always remains open, and the electrically-operated piston-valve, which will be described in connection with the electrical apparatus, is solely utilized.

As shown in Figs. 8 to 11, inclusive, the phonographic reproducer 100 and the telephonic transmitter 101 are secured face to face upon a suitable frame 102, which in turn is pivotally carried upon a stud, arm, or projection, one or more, extending out from or carried by the carriage 25. I have shown in the drawings as such stud, arm, or projection a tubular socket 103, within which a ball 104, carried by the frame 102, fits and to which it is secured by pivot-screws 105. The tubular character of this device is such that the phonographic part can be used, if desired, as a record-maker as well as a reproducer by being placed in an ordinary way upon an ordinary phonograph. This, however, as will be readily understood, is not necessary to the operation of my present invention and any simple pivoted connection (for the purposes of said invention) may be substituted without detriment.

As shown in Figs. 1 and 9, flexible wires 106 and 107 lead off to binding-screws 108 and 109, from which the regular telephonic line-wires 110 and 111 lead into and form a part of the circuit to which subscribers' telephones are attached. An ordinary telephonic receiver 112 is shown in Fig. 1 connected to the extreme ends of the wires 110 and 111 and illustrates the use of the apparatus. In the use of the apparatus in connection with a telephone-exchange of course this telephone-circuit passes through the exchange or central station.

As above stated, the telephonic transmitter and the phonographic reproducer should be secured together, and the frame is carried upon pivot-screws 105, the arrangement being such that said structure may freely move on said pivot-screws. During the time when this structure is descending the contact-point of the phonographic reproducer must of course rest against the surface carried by

the cylinder 8, upon which the inscription has been placed. The preferable arrangement is that this contact should be maintained by the gravity of the parts, the greater portion of the weight thereof being on the inner side of the pivot-screws 105. During the time, however, when the carriage 25, carrying the transmitter and reproducer, is ascending manifestly the contact-point ought to be free from the surface bearing the inscriptions. I have therefore provided an arm 113, which extends out from the structure including said transmitter and reproducer, and have pivoted a bell-crank lever 114 to the carriage 25, one arm of which said lever 114 extends up through a slot in the arm 113 and the other of which is bent to one side and passes behind one of the frame members, as 6, and at suitable points on this frame member, near the bottom and top thereof, are the projections 115 and 116. The operation is, as the apparatus reaches the lower end of its stroke, that the arm of the bell-crank lever which passes behind the frame member will come in contact with the projection 115, and said bell-crank lever is thus caused to throw the arm 113 and the structure to which it is attached over, freeing the contact-point of the phonographic reproducer from the cylinder 8 and holding it out of contact until the carriage has reached its highest point of ascent. At this point is located the projection 116, with which the bell-crank lever again comes in contact, reversing the movement and permitting the structure to fall forward, so that the contact-point rests against the surface on the cylinder 8, ready for the operation which has already been described.

The structure embodying the telephonic transmitter and the phonographic reproducer is, as has already been described, pivoted on pivot-screws 105, upon which said structure is nicely balanced. When the bell-crank lever 114 is thrown back, as shown in Fig. 11, the weight of the arm 113 and of the part of the bell-crank lever 114 which rests against the same is sufficient to hold the structure away from the record-surface, while when the bell-crank lever is tipped forward said structure being relieved from its weight tips forward against the record-surface by gravity.

In Fig. 13 I have shown the timepiece by which the movements are governed and the electromagnet which operates the escape-valve. The electromagnet is also shown in Figs. 1, 3, 4, and 6. In Figs. 4 and 12 I have shown the construction of the valve in question, in which the valve proper, 117, is normally held closed by a spring 118 and is unseated or opened by a piston 119. The opening is effected by the armature-bar 120, which is operated to press said piston inwardly when the magnet-coils 121 are energized, and this energization is accomplished by closing the electric circuit 122 123 running from said coils through the battery B to the terminals 124 and 125 in the timepiece. The terminal

124 extends out past the shaft 126 of the time-piece, which shaft carries a cam 127, which is adapted as it revolves to press upon the terminal 124, (which is thin and elastic and
 5 which preferably has a wedge-shaped end 128 as the point of immediate contact, as best shown in Fig. 14,) thus forcing said terminal 124 sidewise, so that a point 129 thereon will come in contact with a similar point 130 on
 10 the terminal 125, and thus complete the circuit and energize the magnet-coils, forcing in the piston 119 and opening the valve. The end of the terminal 125, which carries the contact 130, is shown as thin and elastic, which
 15 form contributes to the ease with which the cam may pass over the wedge-shaped end of the terminal 124.

Situated at a convenient point alongside the piston 119 is a detent 131, which is adapted
 20 to hook over a shoulder *s* on said piston and prevent it from being restored to its normal position by the action of the spring 118 until released. This detent is forced forward into engagement with said shoulder by a suitable
 25 means, such as the spring 132, coiled about its pivot *p*. The disengagement is effected at the proper time by the lever 133, which extends out and comes in contact with the lever 40. At the time, however, when the ener-
 30 gization of the magnet-coils takes place this lever 40 is in the position shown by the full lines in Fig. 7, so that the detent is free to operate. As will be readily seen, the valve 117 is held open by said detent until in due
 35 course the lever 40 is thrown to the position shown in Fig. 1 and by the dotted lines in Fig. 7, which then operates through the lever 133 to disengage the detent 131 and permit the spring 118 to operate.

40 The timepiece shown in Fig. 13 is or may be of any usual or desired character. The mechanism thereof is not shown except the pallets and scape-wheel, and the cam which performs the active work of closing the cir-
 45 cuit is shown as mounted on the scape-wheel shaft. It will be understood that where this cam is actually mounted on the scape-wheel shaft it is in the larger class of timepieces, such as large clocks, where the scape-wheel
 50 revolves once a minute. When the apparatus is used with smaller timepieces, this cam would be placed upon another shaft of the train, as the scape-wheel shaft in small timepieces would revolve too rapidly for my
 55 purpose. This is, however, obviously a mere matter of selection and arrangement in adapting the particular timepiece which it may be found convenient to employ to use with the other parts of the invention. It is also obvi-
 60 ous that my invention may be so arranged as to tell the time more or less frequently than each minute, and the periods covered by each cylinder-surface may be greater or less than twelve hours, although obviously less con-
 65 venient. The instrument which I have in contemplation, however, as hereinbefore in-

dicated, includes a cylinder each of whose operative surfaces or coverings shall bear seven hundred and twenty inscriptions, each naming one of the minutes during a period
 70 of twelve hours, so that the patrons of the apparatus may be informed of the exact time of any minute of any hour of the day. The cylinders bearing the inscriptions are of course changed whenever worn out by the
 75 operative in charge of the apparatus, and in case of an instrument arranged for a different period of time than twelve hours would be changed at the end of each such period.

An apparatus like this being situated in or
 80 connected with a telephone-exchange, the operation of my invention is as follows: Any telephone-subscriber who is entitled to this service and who desires to know the exact time will call the exchange in the usual man-
 85 ner and ask to be connected with "time." Connection with this apparatus is then made in the same manner that it is made with a subscriber who is "called," except that the connections are so arranged that manipula-
 90 tion of the instrument is unnecessary, it being designed to be always in order and continuously in operation. The subscriber then merely listens until the next period (as minute) after being connected arrives, when the
 95 apparatus will tell the time audibly, so that all telephone-users who are connected will understand it. If, for instance, the time in question is twenty-nine minutes past twelve, the instrument will say after the usual man-
 100 ner of phonographic instruments "twelve twenty-nine," which will be heard by the persons listening at the various telephones which have been connected during the preceding minute or have remained so connected for
 105 more than a minute. It is the design that any number of telephones may be connected with this circuit at one time, so that all the telephone-subscribers who are desirous of learning the time and who are entitled to this
 110 service may do so without waiting for any others.

I have shown that construction and relative arrangement and operation of parts which I have designed for the special service of tell-
 115 ing the time. I do not, however, desire to confine myself to such construction and arrangement, as any arrangement of a record-bearer, a phonographic reproducer, a telephonic transmitter, and a telephone-circuit,
 120 including one or more telephonic receivers adapted to be connected therewith, whereby a message inscribed upon the record-bearer may be phonographically reproduced and by the mechanical operation of the apparatus telephonically conveyed, is within the scope
 125 of my invention.

Having thus fully described my said invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a phonographo-telephonic announcer, the combination of a record-bearer, a phono-

graphic reproducer arranged in suitable relation to said record-bearer, a telephonic transmitter arranged to receive sounds from said reproducer, a telephone-circuit connected therewith including telephonic receivers, a propelling means adapted to cause the necessary relative change of position between the record-bearer and the phonographic reproducer, whereby a message inscribed upon said record-bearer may be phonographically reproduced and by the mechanical operation of the apparatus telephonically conveyed, and an electric circuit embodying an automatically-operated circuit-closer for controlling said propelling means.

2. In a phonographo-telephonic announcer, the combination, with a record-bearer, of a structure adapted to travel along said record-bearer comprising a phonographic reproducer and a telephonic transmitter arranged in such relation thereto as to receive the sounds therefrom, a telephonic circuit connected therewith including telephonic receivers, whereby the message thus phonographically reproduced may be telephonically conveyed, and an electric circuit embodying an automatically-operated circuit-closer for controlling said propelling means.

3. The combination, in a phonographo-telephonic annunciator, of a suitable framework, a cylindrical record-bearer mounted therein adapted to revolve with a step-by-step movement and bearing upon its surface longitudinally-disposed inscriptions stating the time by succeeding periods, a phonographic reproducer mounted in a suitable carriage and adapted to travel longitudinally of said record-bearer, a telephonic transmitter connected to said phonographic reproducer, telephonic receivers adapted to be connected with the same electric circuit as said telephonic transmitter, means including an electromagnet whereby the carriage carrying the phonographic reproducer is propelled in the desired relation to the record-bearer, an electrical circuit running from said electromagnet to terminals in a timepiece, and a circuit-closer in said timepiece actuated by the mechanism thereof, whereby, at any predetermined period of time, the circuit is closed and the carriage-operating means thus started into operation.

4. The combination, in a phonographo-telephonic announcer, with the cylindrical record-bearer, of a step-by-step feeding mechanism arranged for revolving said record-bearer in a uniform forward direction including a circular rack a hub on the cylinder-shaft and means whereby said rack and said hub may be accurately adjusted in relation to each other, and means for propelling the rack, substantially as set forth.

5. The combination, in a phonographo-telephonic announcer, of the record-bearer, a hub 12 secured to the shaft of said record-bearer and having curved slots therein, a circular rack secured to said hub by means of

screws passing through said slots, and means for accurately adjusting the relation of said rack to said hub, substantially as set forth. 70

6. The combination, in a phonographo-telephonic announcer, of the record-bearer, a circular rack mounted on the shaft of said record-bearer, a reciprocating bar carrying a pawl adapted to engage with the teeth of said rack, means for moving said reciprocating bar back and forth, and a spring-detent the point whereof is wedge-shaped and fits closely between each pair of teeth as the record-bearer is fed forward, thus holding it accurately to position at each step in its progress, substantially as set forth. 75 80

7. The combination, in a phonographo-telephonic announcer, of a record-bearer, a track or way running longitudinally of said record-bearer, a carriage bearing the phonographic reproducer and the telephonic transmitter adapted to travel over said track or way, a circular rack secured to the shaft of said record-bearer, a reciprocating pawl structure adapted to engage with and propel said rack, and connections extending from said reciprocating pawl structure into the path of said carriage, whereby as said carriage moves on its way to its initial position it operates said mechanism to advance said record-bearer to the point where the succeeding inscriptions may be utilized. 85 90 95

8. The combination, in a phonographo-telephonic announcer, of the record-bearer 8, the circular rack 11 thereon, the reciprocating pawl structure 58, 59, the rock-shaft 55 engaging with said pawl structure and having a crank-arm 54, a rod or cord 53, an arm 51, and a reciprocating carriage 25, substantially as shown and described. 100 105

9. The combination, in a phonographo-telephonic announcer, of the record-bearer, a carriage bearing a transmitting apparatus traveling longitudinally of said record-bearer, and means for operating said carriage, consisting of a cylinder, a piston therein adapted to be operated by a fluid, a piston-rod attached in a suitable manner to the carriage, a valve adapted to control the ingress of the fluid to the cylinder, a rod positioned alongside the path of the carriage and having suitable striking-points whereby its position is shifted by the carriage at each end of its stroke, and a lever controlled by said rod and extending out to and controlling said valve, whereby said valve is opened by the arrival of the carriage at one end of its journey and closed by the arrival of said carriage at the other end of its journey. 110 115 120 125

10. The combination, in a phonographo-telephonic announcer, with the record-bearer, the transmitting apparatus, a carriage therefor moving over said record-bearer, and means whereby said carriage is propelled; of a starting apparatus for said propelling means, including an electrical circuit having its terminals in a timepiece, said timepiece, and a contact-maker actuated by said timepiece 130

whereby the electrical circuit is closed at predetermined intervals of time and said propelling apparatus thus set in motion at the instant of each such predetermined period.

5 11. The combination, in a phonographo-
telephonic transmitter, of the record-bearer,
the carriage bearing the transmitting appa-
ratus traveling over said record-bearer, and
actuating means for propelling said carriage
10 comprising a fluid-actuated piston and its
cylinder, an ingress-pipe to said cylinder, an
egress-pipe to said cylinder, a piston-valve to
said egress-pipe, an electromagnet situated
adjacent thereto the armature whereof is
15 adapted to force in and thus open said valve,

an electrical circuit including said electro-
magnet and having its terminals in a time-
piece, and a contact-maker actuated by said
timepiece for closing the circuit at predeter-
mined intervals of time, thus energizing said 20
electromagnet and opening the valve, sub-
stantially as and for the purpose set forth.

In witness whereof I have hereunto set my
hand and seal, at Indianapolis, Indiana, this
4th day of July, A. D. 1898.

JOHN E. EVARD. [L. S.]

Witnesses:

CHESTER BRADFORD,
CHARLES E. SLOAN.

March 1st 1851

Respectfully from a
Dear Friend to your Honor

Yours truly
J. W. [unclear]

No. 648,935.

Patented May 8, 1900.

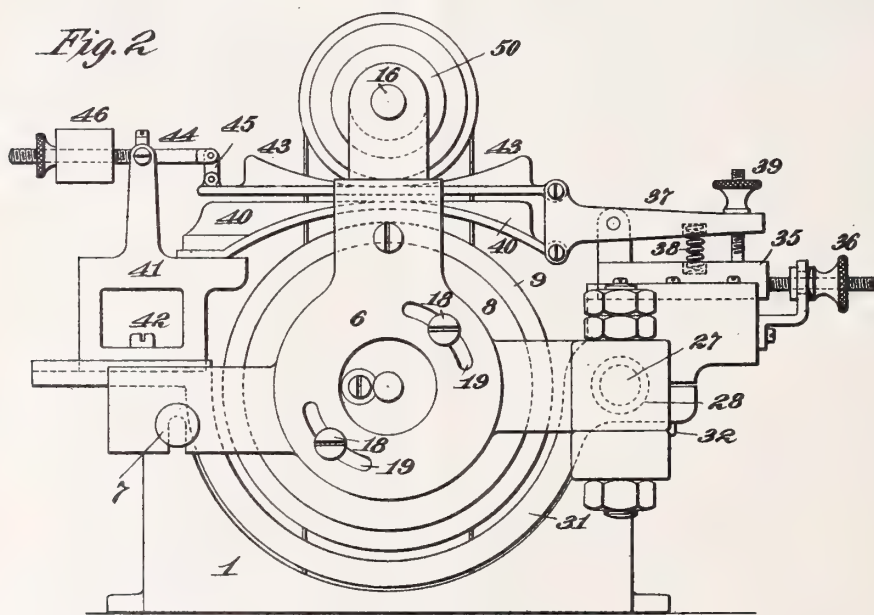
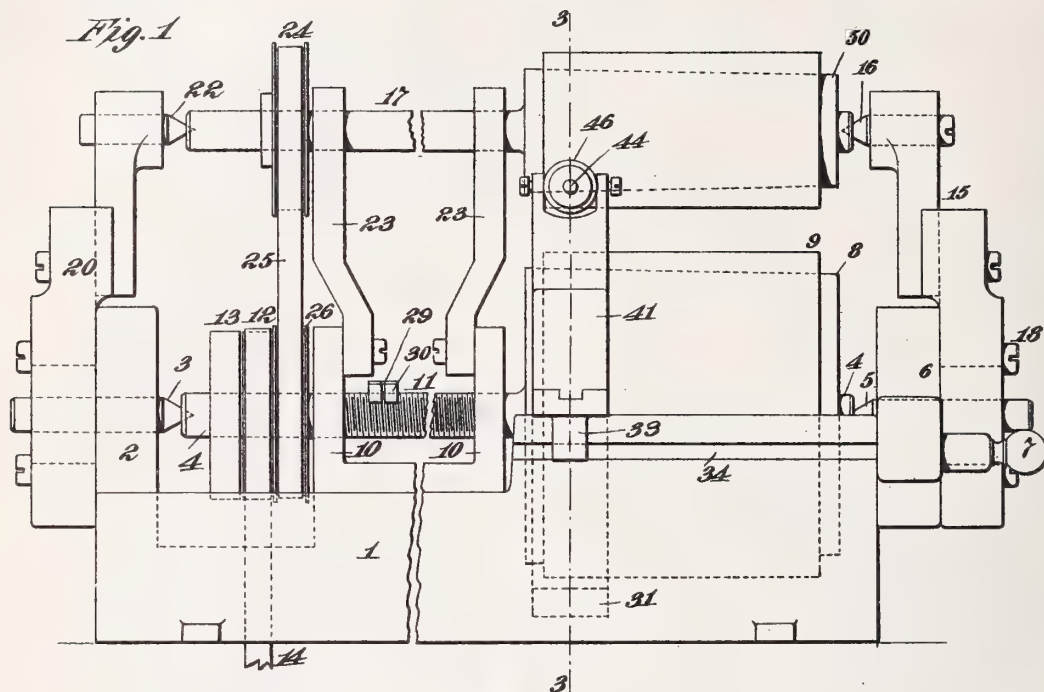
T. A. EDISON.

APPARATUS FOR DUPLICATING PHONOGRAPH RECORDS.

(Application filed Oct. 28, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

John F. Coleman
Geo. R. Taylor

Inventor

Thomas A. Edison
by Alfred Edmunds

Att'ys.



No. 648,935.

Patented May 8, 1900.

T. A. EDISON.

APPARATUS FOR DUPLICATING PHONOGRAPH RECORDS.

(Application filed Oct. 28, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3

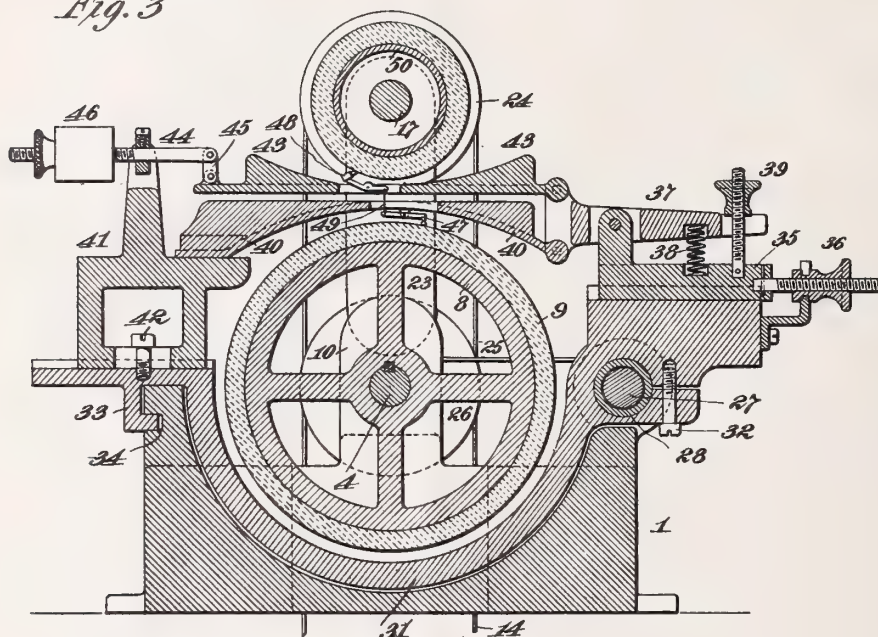
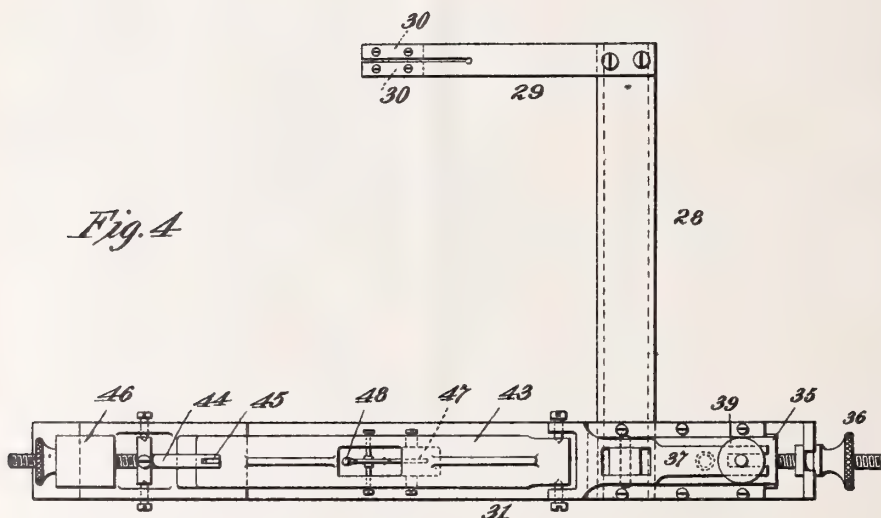


Fig. 4



Witnesses:

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Geo. R. Taylor

Inventor

Thomas A. Edison
by J. H. Edwards

Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

APPARATUS FOR DUPLICATING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 648,935, dated May 8, 1900.

Application filed October 28, 1899. Serial No. 735,043. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex, State of New Jersey, have invented a certain new and useful Improvement in Apparatus for Duplicating Phonograph-Records, (Case No. 1,016,) of which the following is a description.

My invention relates to improvements in apparatus for duplicating phonographic records from a master by a mechanical process.

In duplicating phonograph-records from masters a reproducing-ball is engaged with the master and communicates its vibrations to a cutting or recording device which is maintained in engagement with a blank on which the duplicate record is to be formed, both master and duplicate blank being simultaneously rotated in the process of duplication. Most, if not all, musical records as at present made on the standard phonographs are characterized in whole or in part by the formation of waves which are of such a character that they cannot be tracked easily by the usual reproducing-ball, since the latter will not be permitted to enter to the full depth of the record-groove. In consequence the reproduced record is not an accurate copy of the master, and the phonographic reproductions obtained therefrom are not equal in volume and quality to reproductions which may be secured directly from the master.

The object of my invention is to provide an apparatus for obtaining duplicate phonographic records which shall be equal in volume and quality to an original or master record and from which in consequence superior reproductions can be secured, particularly if the reproducing device is of a character to accurately track all portions of the reproduced record.

In carrying my invention into effect I provide a master-record of such a character that all portions of the record-groove can be accurately tracked by the usual reproducing device, and to this end I employ a master-record which is of a sufficient diameter to provide for the formation of a record-groove which can be engaged throughout its length and accurately tracked by the usual reproducing device, and I engage with such a master-record a suitable reproducing device,

which is mechanically connected with a recording or cutting device, the latter engaging a phonograph-blank, preferably of standard size, and which will be turned at a lower surface speed than the master. In this way the reproducing device will accurately track all portions of the groove on the master-record, and the reproduced record obtained therefrom will be characterized by the full depth of cut of an original standard phonograph-record.

In order that the invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a side view of the improved apparatus; Fig. 2, an end view thereof; Fig. 3, a sectional view on the line 3 3 of Fig. 1, and Fig. 4 a detached plan view of the reproducing mechanism.

In all of the above views corresponding parts are represented by the same numerals of reference.

1 represents a suitable base carrying a lug 2 at one side, in which is carried an adjustable cone 3, forming one of the end bearings of a main shaft 4. A bearing-cone 5 for the other end of said shaft is carried in a gate 6, pivoted at one side to the frame 1 and adapted to be locked at the other side by the usual locking-knob 7. The shaft 4 carries the mandrel 8 for the master 9, which is of an abnormally-large external diameter, preferably from five to six inches. A record made on a cylinder having a diameter of from five to six inches and rotated at the usual shaft speed of about one hundred and twenty turns per minute will be sufficiently extended as to be practically free from waves or depressions which cannot be accurately tracked to the full depth by a spherical reproducing device. Obviously, however, if the shaft speed is increased the formation of objectionable waves or depressions will be avoided on a record of less diameter. Guides 10 support the shaft 4 and the mandrel 8 when the gate 6 is opened to permit of the insertion upon and the removal from the mandrel 8 of a master-record. The shaft 4 is screw-threaded at 11, as shown, to provide for the feed of the reproducing mechanism, as will be explained. Said shaft carries a tight pulley 12 and a loose pulley

13, and a driving-belt 14 normally engages with the former to rotate said shaft. By shifting the belt to the loose pulley 13 rotation of the shaft will be arrested. The gate 6 carries
 5 an arm 15, provided at its upper end with a bearing-cone 16 for a supplemental shaft 17. The arm 15 is pivoted to the gate 6 concentrically with the bearing-cone 5 and is secured in place to the gate by means of screws
 10 18, which work in slots 19 and by which an adjustment is provided for the arm 15. A corresponding arm 20 is carried by the lug 2 by means of adjusting-screws 21, and a bearing-cone 22 is mounted at the upper end of
 15 said arm to form the other bearing for the supplemental shaft 17. Supporting-arms 23 are carried from the guides 10 and are adjustable with respect to said guides for supporting the supplemental shaft 17 when the gate
 20 6 is swung open, as will be understood. The supplemental shaft 17 carries a pulley 24, which connects by a belt 25 with a pulley 26 of the same diameter mounted on the shaft 4, whereby the shafts 4 and 17 will have the
 25 same velocity of rotation. These shafts may be connected together in any other suitable way, although I prefer a belt for this purpose owing to the absence of vibration therein.

A supporting-bar 27 is carried in the frame
 30 1, preferably in line with the shaft 4, parallel therewith and at the back of the machine. Sliding upon this bar is a sleeve 28, from which a spring-arm 29 extends, said arm carrying threaded blocks 30 at its end, which
 35 engage with the screw-threaded portion 11 of the shaft 4, so that when the said shaft is rotated the sleeve 28 will be fed laterally upon the supporting-bar 27. A frame 31 for the reproducing mechanism is clamped upon the
 40 sleeve 28 by means of a screw 32 or is secured to said sleeve in any other suitable way, and said frame is provided with a curved portion which extends beneath the master on the mandrel 8 and clears the same. The front
 45 portion of the frame 31 bears upon the front edge of the frame 1 and is provided with an inturned hook 33, engaging a groove 34 in the frame 1, so as to hold the frame from upward movement. The frame 31 carries at its rear
 50 upper surface an adjusting-block 35, the position of which is adjustable by a thumb-nut 36, so that said block may be moved toward and away from the master-record. This block supports a pivoted lever 37, normally forced
 55 upward at its rear end by a heavy spring 38 and adapted to be adjusted downward at that end by an adjusting-nut 39. Pivoted to the lower forward end of the lever 37 is a bridge 40, which extends between the master-record
 60 and the blank and is supported at its forward end on a frame 41, adjustably secured to the frame 31 by means of a screw 42. Pivoted to the lever 37, above the bridge 40, is a floating bridge 43, connected at its forward end to a weighted lever 44 by means of
 65 a link 45. The weight 46 of said lever is adjustable thereon, as shown. Pivoted to the

bridge 40 is a suitable pivoted reproducing device 47, comprising, essentially, a lever carrying at one end the usual reproducing-ball, and
 70 pivoted to the floating bridge 43 is a recording or cutting device 48, comprising, preferably, a pivoted lever carrying at one end a cutting or gouging tool of the usual circular
 75 form at its cutting edge. The free ends of the reproducing and recording levers are connected together by a link 49, comprising, preferably, a fine wire.

When a master-record of the proper size is placed on the mandrel 8 and a blank on
 80 which the record is to be reproduced, preferably of the standard size, is placed on a mandrel 50, carried by the supplemental shaft 17, the weight 46 will elevate the floating
 85 bridge 43 to engage the reproducer 47 with the master and the recorder 48 with the blank. The degree of pressure with which the recorder 48 engages the blank is dependent upon the effect of the weight 46, as will be
 90 understood, and said weight will therefore be adjusted so as to give to the recorder the proper amount of cut necessary to secure the best results. The effect of the weight 46 being to hold the reproducer in engagement with
 95 the master and the recorder in engagement with the blank with a definite pressure, any movement of the reproducer due to the engagement of the master will be communicated to the recorder, and hence a record will be cut
 100 in the blank, it being understood that the inertia of the weight 46 is so relatively great that the small vibrations to which the reproducing and recording devices are subjected will not affect the same.

By using a master-record of such a size as
 105 to enable a record to be formed which can be accurately tracked by the reproducing device and by running such a master at the same shaft speed as a standard blank I am enabled to obtain reproduced records on standard-
 110 blanks which will be equal in every respect, and especially in the depth of cut, to original standard records and which are not open to the objection which now exists to reproduced records obtained by present methods. By
 115 providing for an adjustment of the block 35 toward and away from the blank or master and for the pivotal adjustment of the lever 37 it will be possible to regulate the inclination of the reproducer or recorder to any angle
 120 which may be necessary with respect to the blanks and by which the best effects will be secured. Any slight adjustment which may be imparted to the block 35 will be compensated at the free end of the floating-bridge
 125 43 by the link 45; but if this adjustment is considerable the supplemental frame 41 may be correspondingly adjusted by loosening the screw 42 and by shifting such supplemental frame toward or away from the master.
 130

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In an apparatus for reproducing phono-

graph-records, the combination with a mandrel carrying a record of large size, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels, a reproducer engaging the master-record, a recorder engaging the blank, and connections between the reproducer and the recorder, substantially as set forth.

2. In an apparatus for reproducing phonograph-records, the combination with a mandrel carrying a record of large size, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels at the same shaft speed, a reproducer engaging the master-record, a recorder engaging the blank, and connections between the reproducer and the recorder, substantially as set forth.

3. In an apparatus for reproducing phonograph-records, the combination with a mandrel carrying a record of large size, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels at the same shaft speed, a bridge straddling the master, a reproducer pivoted to said bridge, a recorder engaging the blank, and connections between the reproducer and the recorder, substantially as set forth.

4. In an apparatus for reproducing phonograph-records, the combination with a mandrel carrying a record of large size, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels at the same shaft speed, a bridge straddling the master, means for adjusting the bridge laterally toward and away from the master, a reproducer pivoted to said bridge, a recorder engaging the blank, and connections between the reproducer and the recorder, substantially as set forth.

5. In an apparatus for reproducing phonograph-records, the combination with a mandrel carrying a record of large size, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a second mandrel extending parallel therewith and carrying a blank of smaller size, of means to rotate both mandrels at the same shaft speed, a bridge straddling the master, means for adjusting the bridge vertically with respect to the master, a reproducer pivoted to said bridge, a re-

corder engaging the blank, and connections between the reproducer and the recorder, substantially as set forth.

6. In an apparatus for reproducing phonograph-records, the combination of a mandrel of large diameter carrying a master-record, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width, a mandrel of less diameter carrying a blank, a stationary bridge straddling the master, a floating bridge pivoted above the stationary bridge, an overbalance-weight for the floating bridge, a reproducer pivoted to the stationary bridge, a recorder pivoted to the floating bridge, and connections between the reproducer and recorder, substantially as set forth.

7. In an apparatus for reproducing phonograph-records, the combination with a mandrel of large diameter carrying a master-record, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a mandrel of less diameter carrying a blank, of a stationary bridge straddling the master, a floating bridge pivoted above the stationary bridge, an overbalance-weight for the floating bridge, a reproducer pivoted to the stationary bridge, a recorder pivoted to the floating bridge, connections between the reproducer and recorder, and an adjusting-lever to which the stationary bridge and the floating bridge are pivoted, substantially as set forth.

8. In an apparatus for reproducing phonograph-records, the combination with a mandrel of large diameter carrying a master-record, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a mandrel of less diameter carrying a blank, of a stationary bridge straddling the master, a floating bridge pivoted above the stationary bridge, an overbalance-weight for the floating bridge, a reproducer pivoted to the stationary bridge, a recorder pivoted to the floating bridge, connections between the reproducer and recorder, an adjusting-lever to which the stationary bridge and the floating bridge are pivoted, and means for adjusting said lever on its pivot, substantially as set forth.

9. In an apparatus for reproducing phonograph-records, the combination with a mandrel of large diameter carrying a master-record, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and a mandrel of less diameter carrying a blank, of a stationary bridge straddling the master, a floating bridge pivoted above the stationary bridge, an overbalance-weight for the floating bridge, a reproducer pivoted to the stationary bridge, a recorder pivoted to the floating bridge, connections between the reproducer and recorder, an adjusting-lever to which the stationary bridge and the floating

bridge are pivoted, means for adjusting said lever on its pivot, and means for adjusting said pivot laterally, substantially as set forth.

10. In an apparatus for reproducing phonograph-records, the combination of a shaft carrying a mandrel of large diameter, a master-record mounted on said mandrel, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width, conical bearings for the shaft, a pair of arms concentrically mounted with respect to said bearings, said arms carrying conical bearings at their upper ends, a supplemental shaft carried in the last-mentioned bearings, a mandrel carried by said shaft of relatively-small diameter, a phonograph-blank mounted on said mandrel, means for rotating both of said shafts, and means for effecting a reproduction from a master-record upon the blank, substantially as set forth.

11. In an apparatus for reproducing phonograph-records, the combination of a shaft carrying a mandrel of large diameter, a master-record mounted on said mandrel, said record being of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width, conical bearings for the shaft, a pair of arms concentrically mounted with respect to said bearings, said arms carrying conical bearings at their upper ends, means for adjusting the inclination of said arms, a supplemental shaft carried in the last-mentioned bearings, a mandrel carried by said shaft of relatively-small diameter, a phonograph-blank mounted on said mandrel, means for rotating both of said shafts, and means for effecting a reproduction from a master-record upon the blank, substantially as set forth.

12. In an apparatus for reproducing phonograph-records, the combination of a shaft carrying a mandrel of large diameter, a master-record mounted on said mandrel, said record being of a sufficiently-large diameter as to be free of waves or depressions which are

of less length than width, conical bearings for the shaft, a pair of arms concentrically mounted with respect to said bearings, said arms carrying conical bearings at their upper ends, means for adjusting the inclination of said arms, a supplemental shaft carried in the last-mentioned bearings, a pair of pivoted supporting-arms similarly adjustable for supporting the supplemental shaft when its end bearings are released, a mandrel carried by said shaft of relatively-small diameter, a phonograph-blank mounted on said mandrel, means for rotating both of said shafts, and means for effecting a reproduction from a master-record upon the blank, substantially as set forth.

13. In an apparatus for reproducing phonograph-records, the combination of a main shaft mounted at one end in a stationary conical bearing and at the other end in a movable conical bearing, a gate for carrying the movable bearing, an adjustable arm mounted concentrically to the stationary bearing and carrying a stationary conical bearing at its upper end, an adjustable arm mounted concentrically to the movable bearing and carried also by said gate, a conical bearing at the upper end of said arm, a supplemental shaft mounted between the bearings carried by said arm, a mandrel mounted on said shaft, a blank carried by said mandrel, means for rotating both of said shafts, a mandrel on the main shaft, a master-record carried by said mandrel and of a sufficiently-large diameter as to be free of waves or depressions which are of less length than width and means for effecting a reproduction from a master on the first-mentioned mandrel to a blank on the mandrel of the supplemental shaft, substantially as set forth.

This specification signed and witnessed this 27th day of October, 1899.

THOMAS A. EDISON.

Witnesses:

J. F. RANDOLPH,

F. C. DEVONALD.

No. 648,975.

Patented May 8, 1900.

E. H. MOBLEY.

DIAPHRAGM FOR SOUND RECORDING, REPRODUCING, AND TRANSMITTING INSTRUMENTS.

(Application filed Jan. 8, 1899.)

(No Model.)

Fig. 1.

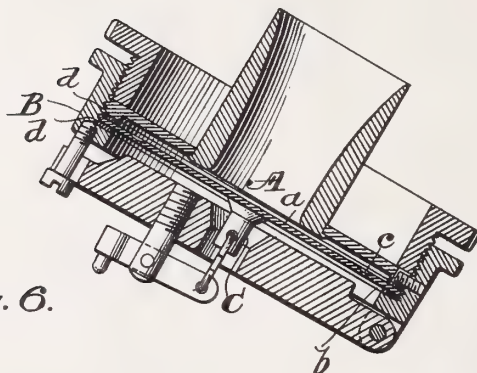


Fig. 6.

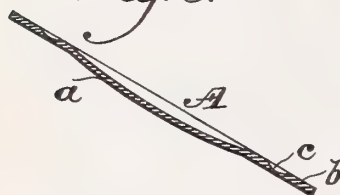


Fig. 2.

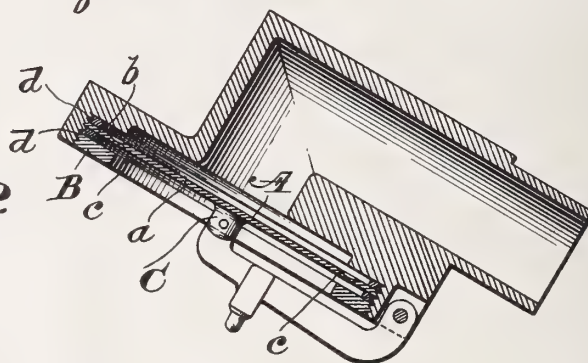


Fig. 3.

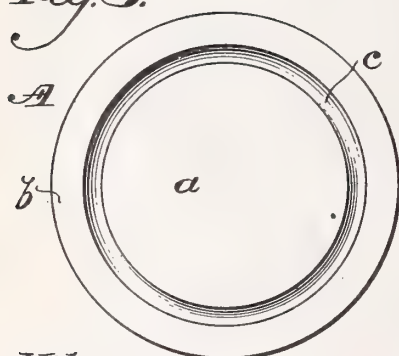


Fig. 4.



Fig. 5.



Witnesses:

Henry D. ...
R. M. Kelly.

Inventor:

Edwin H. Mobley
Very truly
[Signature]

UNITED STATES PATENT OFFICE.

EDWIN H. MOBLEY, OF PHILADELPHIA, PENNSYLVANIA.

DIAPHRAGM FOR SOUND RECORDING, REPRODUCING, AND TRANSMITTING INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 648,975, dated May 8, 1900.

Application filed June 8, 1899. Serial No. 719,762. (No model.)

To all whom it may concern:

Be it known that I, EDWIN H. MOBLEY, of the city and county of Philadelphia, State of Pennsylvania, have invented an Improvement in Diaphragms for Sound Recording, Reproducing, and Transmitting Instruments, of which the following is a specification.

My invention relates to diaphragms for sound recording, reproducing, and transmitting instruments; and it consists of the improvements which are fully set forth in the following specification and are shown in the accompanying drawings.

Many efforts have been made to improve the tone, volume, and quality of sounds transmitted by sound recording, reproducing, and transmitting instruments, and these efforts have been chiefly directed toward the improvement of the diaphragms, through the vibrations of which the sound-waves are transmitted. In most of the diaphragms used much of the sound is lost by the transmission of a part of the vibrations laterally through the diaphragm to the head or frame by which the diaphragm is carried, which has the effect not only of decreasing the effective vibrations, but also of imparting an artificial tone or "timbre" to the transmitted sounds by the vibrations of the substance of the head or frame. To overcome this difficulty, it has been proposed to form the central and outer portions of the diaphragm of distinct pieces united by strips between the central and outer portions. In such cases the openings formed in the diaphragm permit a portion of the sound-waves to pass through the openings without acting upon the diaphragm. Such sound-waves are lost and the passage of the air-currents through these openings tends to affect the sound-waves produced by the vibrations of the central portion of the diaphragm. It has also been proposed to form the central and outer portions of the diaphragm of separate pieces connected by an annulus or ring; but in such case the connecting annulus or ring has impeded rather than increased the vibration of the central plate and has not effectively prevented the lateral transmission of vibrations to the outer portion and thence to the frame or head.

It is the object of this invention to obtain the maximum effect of the vibration of the diaphragm with a minimum dissipation or loss by lateral transmission and at the same time to avoid the presence of openings or perforations in the body of the diaphragm.

In carrying out my invention I provide the diaphragm, which consists of a thin disk of metal or other suitable material, with a very thin or attenuated portion between the center of the disk to which the vibrations are imparted and the outer edge by which the diaphragm is clamped or secured in the frame.

In the accompanying drawings, Figure 1 is a vertical sectional view of a reproducer-head of a phonograph employing my improved diaphragm. Fig. 2 is a similar view of the reproducer-head of a graphophone. Fig. 3 is a plan view of the diaphragm. Fig. 4 is a cross-sectional view of one form thereof. Fig. 5 is a similar view of another form, and Fig. 6 is a cross-sectional view of a diaphragm embodying my invention and illustrating an additional feature thereof.

My improved diaphragm may be used in any sound recording and reproducing instrument. For purposes of illustration I have shown it applied to the reproducing-heads of a phonograph and graphophone. It may also be employed in gramophones and in the recording as well as in the reproducing heads and may be used in telephonic apparatus.

My invention is not concerned with the construction of the sound recording and reproducing instruments, and as the phonograph and graphophone reproducers shown are of well-known construction they will not be particularly described.

A is a diaphragm, which may be composed of a thin disk or plate of any suitable material, whether metallic, vegetable, or animal. I prefer, however, to employ metal, and have obtained most excellent results with forged steel. This diaphragm is composed of a central portion *a* and an outer portion *b*, surrounding the central portion and united therewith by a continuous and relatively-attenuated narrow part *c*. In my preferred construction the diaphragm may be produced by making a continuous annular groove in its

surface, forming the attenuated portion *c* and a relatively-thick central portion *a* and outer inclosing portion *b*, and this groove may be made upon one surface only, as shown in Fig. 5.

5 4, or upon both surfaces, as shown in Fig. 5.

It will be understood that the thickness of the diaphragms shown in the drawings, and particularly in Figs. 4 and 5, is greatly exaggerated for purposes of illustration. In
10 practice the diaphragm is a very thin sheet; but the central portion *a* and the outer inclosing portion *b* are relatively of substantially greater thickness than the connecting portion *c*. I find that the sound may be ma-
15 terially improved by making the front face of the diaphragm convex or by making the central portion *a* concavo-convex, as shown in Fig. 6. It is not necessary that the outer por-
20 tion *b* should be of the same thickness as the inner central portion *a*. It may, if desired, be made heavier or thicker to form a more effective means of clamping the diaphragm in place. The diaphragm is clamped or secured
25 in the head in the usual manner by the outer portion *b*, as by a clamping-ring *B* between washers *d*. The shank *C* of the stylus, needle, or point is connected with the central portion *a* in the usual manner. The ad-
30 vantages of this construction are that the attenuated connecting portion *c* by reason of its relatively-greater thinness permits a much greater resilience in the central or operative portion of the diaphragm, so that that por-
35 tion is much more sensitive to the sound-waves and more accurately transmits the vibrations; also, that the vibrations of the central portion of the diaphragm are not trans-
mitted laterally to so great an extent through the attenuated portion *c* to the outer portion *b*,
40 and are consequently not dissipated or lost, and also that as the diaphragm is closed throughout and not provided with any openings or perforations there is consequently no
45 passage of air currents or waves directly through it which would result in a loss of part of the effective vibrations and also objection-

ably affect those transmitted through the plate.

What I claim as new, and desire to secure by Letters Patent, is as follows:

1. A diaphragm for sound recording, re-
50 producing and transmitting instruments, consisting of a thin plate or disk having its central portion connected with the outer portion or edge by a relatively thin or attenuated
55 connecting part, said central portion and outer portion being of greater thickness than said connecting portion.

2. A diaphragm for sound recording, re-
60 producing and transmitting instruments, consisting of a thin plate or disk having its central portion connected with the outer portion or edge by a relatively thin or attenuated
65 connecting part said diaphragm being composed of a single integral piece.

3. A diaphragm for sound recording, re-
producing and transmitting instruments con-
70 sisting of a thin plate or disk having a continuous groove adjacent to its outer edge forming a relatively thin or attenuated portion *c* between the relatively-thick central portion
and outer edge.

4. A diaphragm for sound recording, re-
75 producing or transmitting instruments consisting of a thin plate or disk having its central portion provided with a convex front face and connected with the outer portion or edge
by a relatively thin or attenuated connecting part.

5. A diaphragm for sound recording, re-
80 producing or transmitting instruments, consisting of a thin plate or disk, having a concavo-convex central portion connected with the outer portion or edge by a relatively thin
or attenuated connecting part.

85 In testimony of which invention I have hereunto set my hand.

EDWIN H. MOBLEY.

Witnesses:

ERNEST HOWARD HUNTER,
J. W. KENWORTHY.

M. D. PORTER.
COLLAPSIBLE ACOUSTIC HORN.

(Application filed July 31, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1

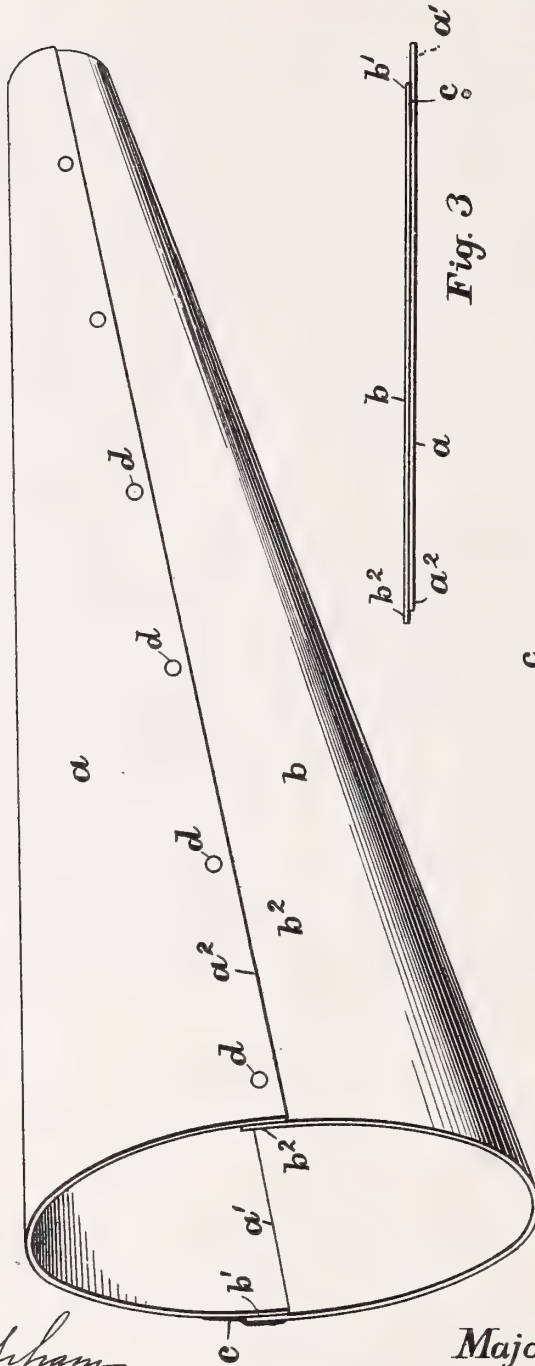
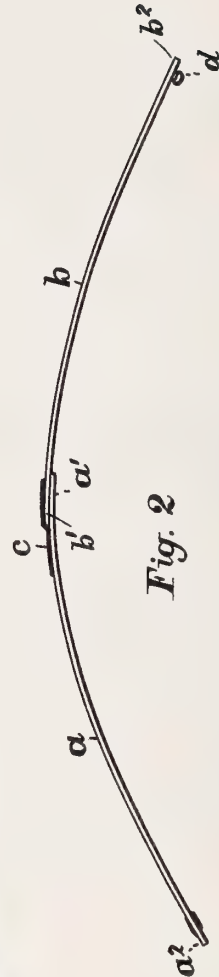


Fig. 3



Fig. 2



Attest;

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F. O. Caller

Inventor,

Major D. Porter;

By A. B. Upham,
His Attorney.

M. D. PORTER.
COLLAPSIBLE ACOUSTIC HORN.

(Application filed July 31, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 4

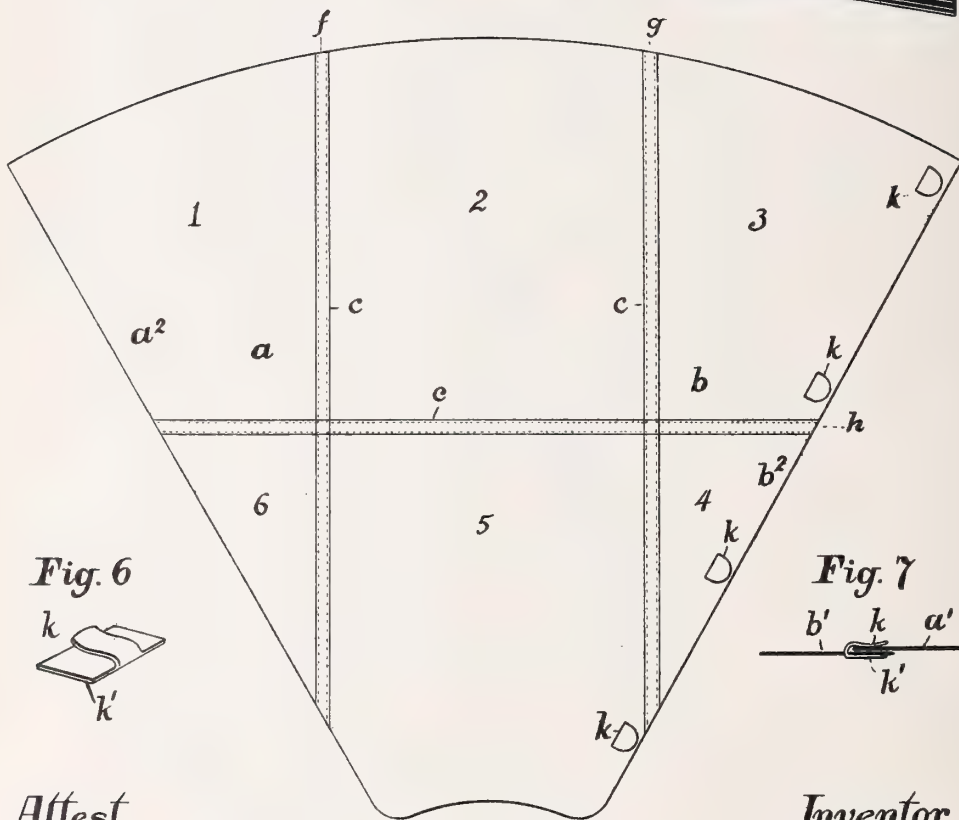
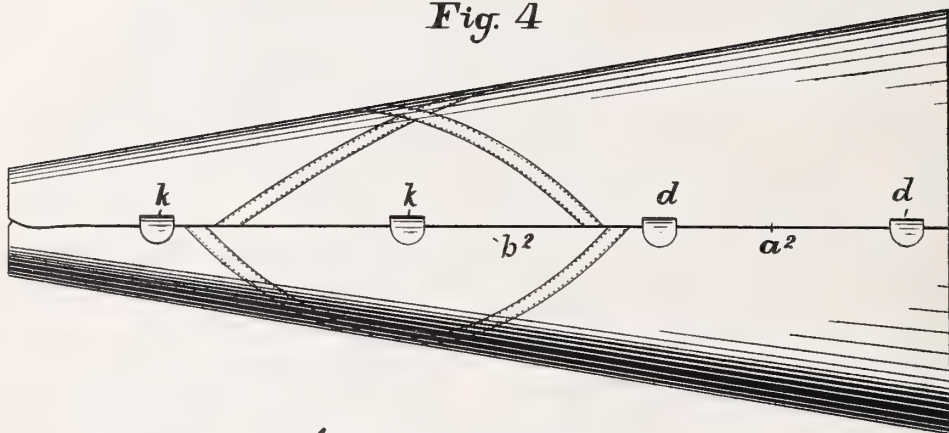


Fig. 6

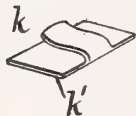
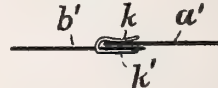


Fig. 7



Attest

M. W. Upham
J. E. Haller

Fig. 5

Inventor,
Major D. Porter;

By M. W. Upham,
His Attorney

UNITED STATES PATENT OFFICE.

MAJOR D. PORTER, OF NEW HAVEN, CONNECTICUT, ASSIGNOR TO THE
INTERNATIONAL STYLOPHONE COMPANY, OF SAME PLACE.

COLLAPSIBLE ACOUSTIC HORN.

SPECIFICATION forming part of Letters Patent No. 648,994, dated May 8, 1900.

Application filed July 31, 1899. Serial No. 725,634. (No model.)

To all whom it may concern:

Be it known that I, MAJOR D. PORTER, a subject of the Queen of Great Britain, residing at New Haven, in the county of New Haven and State of Connecticut, have invented a new and useful Collapsible Acoustic Horn, of which the following is a full, clear, and exact description.

The object of this invention is the construction of a horn for general acoustic purposes, such as what is usually termed a "megaphone," or for phonographs and other talking-machines, which horn shall be capable of being folded into the smallest possible compass for greater convenience in transportation and storage, and yet can be immediately expanded into its perfect and normal condition for use. In accomplishing these results I form the horn from moderately-thin press-board, celluloid, or other material capable of ready, but not too easy, bending, and divide it longitudinally into two or more sections, with certain edges hinged together and the others provided with fastening devices easily engaged or disengaged. An ordinary hinged connection will not do for this purpose, however, as I have found from experiment, for the material being pliable only to a limited degree the hinges will become the apex of a somewhat-acute angle instead of an evenly-rounded curve. To remedy this defect in a simple and inexpensive manner, I form the hinge of some fabric or other pliable material and locate the same at some little distance back from the edge of one of the sections. By this means the outjutting edge serves as a fulcrum, which compels the material itself to bend instead of the hinge, and thereby gives to the horn the circular line in cross-section which is required.

Referring to the drawings forming part of this specification, Figure 1 is a perspective view of the horn embodying my invention. Fig. 2 is a transverse section of the same with the two sections thereof unfastened at one edge. Fig. 3 is a transverse section of said sections folded back to back. Fig. 4 is a side elevation of an improved form of my horn. Fig. 5 is a plan view of this latter horn laid flat. Fig. 6 is a perspective view of my preferred form of fastening for the edges of the

horn-sections, and Fig. 7 is a detail sectional view showing the manner in which the edges of the horn-sections are held by said fastening.

Turning to Fig. 1, it will be seen that the horn is composed of the two sections a and b , held together at the edges a' b' by a hinge c , preferably formed of fabric or leather. As shown, said edges overlap for a short distance, usually about half an inch, in order to preserve the true curve of the horn, as above set forth. For the same purpose the section edges a^2 b^2 are made to overlap for a similar distance and provided with fastenings d for securing them together. Such fastenings may be the common ball-and-socket devices used for gloves and purses, as indicated in the drawings. The hinge c is adapted to permit the two horn-sections to be folded back to back, as in Fig. 3, and thereby enable the same to lie perfectly flat.

In my preferred construction I divide the horn into six sections, as shown in Fig. 5, in order to enable the same to be folded into the smallest possible compass. The lines of severance for this purpose are three in number f , g , and h , f and g running parallel to each other and h at right angles with the others. The last of said lines of severance h is adapted to be folded in either direction, but the lines f g are hinged substantially like that of the construction illustrated in Figs. 1, 2, and 3.

The fastening devices for the edges a^2 b^2 are formed, as shown in Figs. 6 and 7, where the thin base k' is provided with the thin flattened hook k . Said base is affixed to the under side of the edge b^2 , preferably by being stitched thereto, with the hook k reaching through a slit therein to the upper surface thereof. (See Fig. 7.) The mouth of this hook is arranged, as in Fig. 7, in order to receive the edge a' of the opposite section, and the opening is slightly constricted to receive said edge quite tightly, and thereby securely retain it.

In knocking down this horn the edge a' is first withdrawn from the grip of the fastenings k , then the sections 1 and 6 are folded over upon the sections 2 and 5, then the sections 3 and 4 are brought over upon the first-named ones, and, finally, the superposed sections 4, 5, and 6 are folded over upon the

combined sections 1, 2, and 3. The entire horn now occupies a space covering no more area than the single section 2, with a thickness equal to the six layers of the material composing the horn. Thus reduced in dimensions the horn can be packed in a very small compass and is hence capable of being carried from place to place in a small grip, a coat-pocket, or similarly-convenient receptacle. While this perfectly adapts the horn for use as a megaphone easy to be carried about and yet ready for use at a moment's notice, my preferable or most valued use for the same is in connection with phonographs. By packing this horn within the case arranged for the phonograph the entire talking-machine is complete, and yet occupies substantially no more space than the sounder mechanism alone. This is a most convenient arrangement for those giving phonograph entertainments at private parties or elsewhere necessitating the machine's being carried from place to place.

What I claim as my invention, and for which I desire to secure Letters Patent, is as follows, to wit:

1. In a collapsible horn, the combination of the sections formed of resilient material and hinged together along a substantially-longitudinal line, said hinge being adapted to permit said sections to be folded back to back but will compel flexure of the material itself when the free edges of the sections are brought together to form the horn, and fastening devices for said free edges, substantially as set forth.

2. In a collapsible horn, the combination of the sections formed of resilient material and hinged together along a substantially-longitudinal line, said hinge being formed of flexible material affixed to the edge of one section and a short distance back of the corresponding edge of the other section, whereby such overlapping edge is adapted to compel flexure of the material composing said sections when they are brought into the desired conical

form, and fastening devices for the free edges of said sections, substantially as and for the purpose set forth.

3. In a collapsible horn, the combination of the sections formed of resilient material and hinged together along a substantially-longitudinal line, and the fastening devices for the free edges of said sections, said fastening devices comprising the thin flat hooks having the bases affixed to the edge of one of said sections and adapted to receive and retain the edge of the other section, substantially as set forth.

4. In a collapsible horn, the combination of the plurality of sections formed of resilient material and shaped as shown, the flexible hinges securing the same together, and the fastening devices for the free edges of said sections, substantially as set forth.

5. In a collapsible horn, the combination of the sections formed of material capable of moderately-resisting flexure, the dividing-line between said sections being substantially longitudinal, and means for securing together the edges of said sections, such means being adapted to compel flexure of the sections themselves and thereby preserve the true conical shape of the horn, substantially as and for the purpose set forth.

6. In a collapsible horn, the combination of the sections formed of resilient material, the flexible hinges uniting said sections, and the fastening devices for securing together the exposed edges of said sections, two of the division-lines of said sections being parallel and substantially longitudinal therewith and the other at right angles to said parallel lines, substantially as set forth.

In testimony that I claim the foregoing invention I have hereunto set my hand this 14th day of June, 1899.

MAJOR D. PORTER.

Witnesses:

GUY H. HOLLIDAY,
A. B. UPHAM.

No. 649,385.

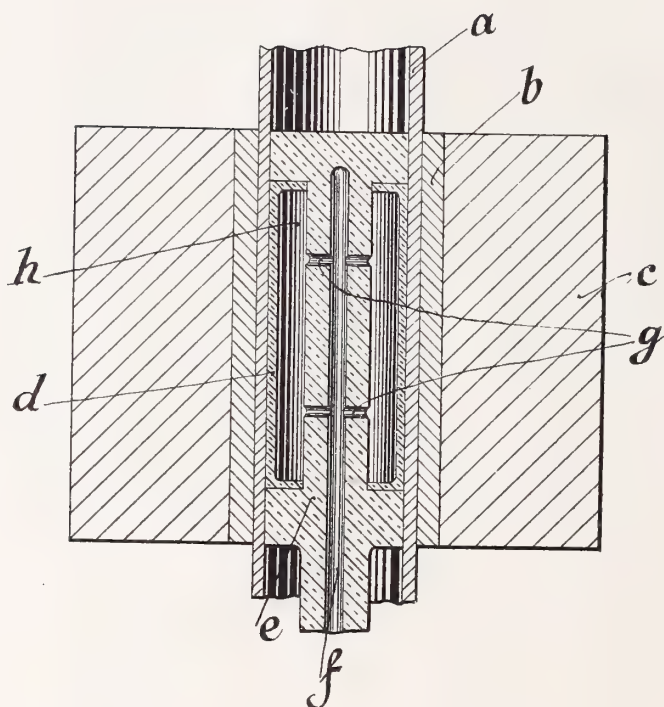
Patented May 8, 1900.

H. G. WOLCOTT.

APPARATUS FOR MAKING PHONOGRAM DUPLICATES.

(Application filed July 25, 1899.)

(No Model.)



Witnesses

H. B. Keefe
Bruce S. Elliott

Inventor

Henry S. Wolcott

By

James L. Norris
att'y

UNITED STATES PATENT OFFICE.

HENRY GOODRICH WOLCOTT, OF FISHKILL-ON-THE-HUDSON, NEW YORK.

APPARATUS FOR MAKING PHONOGRAM-DUPPLICATES.

SPECIFICATION forming part of Letters Patent No. 649,385, dated May 8, 1900.

Application filed July 25, 1899. Serial No. 725,060. (No model.)

To all whom it may concern:

Be it known that I, HENRY GOODRICH WOLCOTT, a citizen of the United States, residing at Fishkill-on-the-Hudson, in the county of Dutchess, State of New York, have invented a certain new and useful Improvement in the Manufacture of Phonogram-Duplicates, of which the following is a specification.

This invention relates to an improvement in the manufacture of phonogram or gramophone or graphophone duplicates; and its object is to produce from the negative copy taken from a wax cylinder upon which the record has first been produced any number of duplicates capable of use for a lengthy period; and it consists, mainly, in evenly pressing by means of a liquid or fluid medium a cylinder or tubing (of plastic material or of a material capable of being rendered plastic by the application of a gentle heat) embedded between said negative copy of the record and a circumferentially-recessed metallic cylinder or piston toward and against said negative copy, thus taking an exact impression therefrom, so that all projections on the inner surface of the latter, forming the "record," properly speaking, will be reproduced on the outer surface of said plastic cylinder or tubing in reversed order, so as to form correspondingly-shaped small impressions which are an exact duplicate of the original record.

In order to carry my invention into effect, I put the negative copy, which preferably is an electro taken from the wax cylinder upon which the record has first been produced, in a housing of cylindrical form, and, further, I place the plastic cylinder or tubing into said electro, whereupon the metallic cylinder or piston, circumferentially recessed to an extent corresponding to the surface of the record to be copied, is introduced into the plastic cylinder. The said piston is provided with an axial bore and with radial or lateral bores extending therefrom toward and into the recessed part of the piston. By introducing compressed air or by pressing a liquid into the recessed part of the piston by way of said bores the plastic cylinder is gently and evenly pressed up to and against the face of the metallic copy or electro, so as to take an exact impression therefrom.

In the accompanying drawing, forming part

of this specification, *b* designates the electro or negative copy of the wax cylinder or record first taken. The outer diameter of said electro exactly corresponds with the inner diameter of the housing or strong-walled cylinder *c*, so that on inserting the electro into said cylinder the former will smoothly fit or adhere to the latter. The plastic cylinder or tubing *a*, preferably consisting of vulcanite, celluloid, or the like, is then placed in the electro, and into the latter the metallic piston *e* is introduced, the recessed part of which having previously been furnished with a kind of a rubber bag *d*, so that the air or liquid which then is to be pressed through the piston-bores *f* and *g*, respectively, into the recessed part or chamber *h* of the piston will act upon the plastic cylinder *a* without finding a way to escape through from the annular chamber *h*, formed by the recessed part of the piston. The pressure thus prevailing in said chamber will evenly and gently act upon the plastic cylinder, pressing the latter against the face of the electro, thereby taking an exact impression therefrom, so that even the most minute projections of the latter will afterward be found on the plastic cylinder in reversed order and with all their delicate details just as found in the original record. As the plastic cylinder is to be chosen a little smaller in size than the internal room of the electro, the former on subsequently reducing the pressure can be removed readily from the latter owing to its yielding capacity and to the diametrical difference existing between both. In order to attain the result aimed at by using merely a moderate pressure in the chamber *h*, either the electro or the plastic cylinder, or both of them, may be gently heated before they are placed into working position, so that the plastic cylinder, and especially its outer surface, will be capable of more readily taking up the impressions from the electro. It is obvious that without departing from the nature of my invention I may introduce the plastic tubing into the electro before the latter has been placed in the housing *c*.

What I claim as my invention, and desire to secure by Letters Patent, is—

The herein-described apparatus for producing phonogram-duplicates consisting of a housing having a cylindrical chamber, an axi-

ally-bored and circumferentially - recessed
piston adapted to be inserted in, and of less
diameter than, said chamber, an impression-
cylinder inserted in said chamber and a plas-
5 tic cylinder, to be impressed, may be inserted
between the piston and said impression-cyl-
inder, and a rubber tube inclosing said cir-
cumferential recess in a manner to afford an
annular chamber, said piston being provided
10 with ports leading from its bore into said

chamber, the combination being and operat-
ing substantially as and for the purpose set
forth.

In testimony whereof I have hereunto set
my hand in presence of two subscribing wit- 15
nesses.

HENRY GOODRICH WOLCOTT.

Witnesses:

ALBERT MASCHKE,

FRIEDRICH WEGNER.

No. 649,725.

Patented May 15, 1900.

A. GRELET & L. VIVES.

PHONOGRAPH.

(Application filed Nov. 16, 1899.)

(No Model.)

Fig. 1.

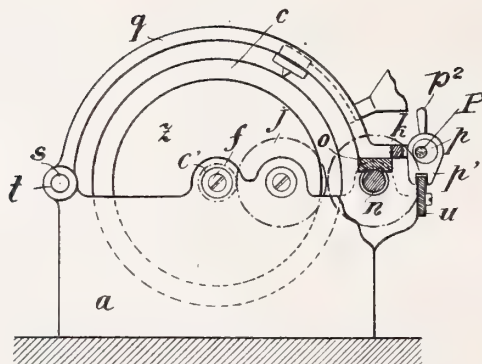


Fig. 2.

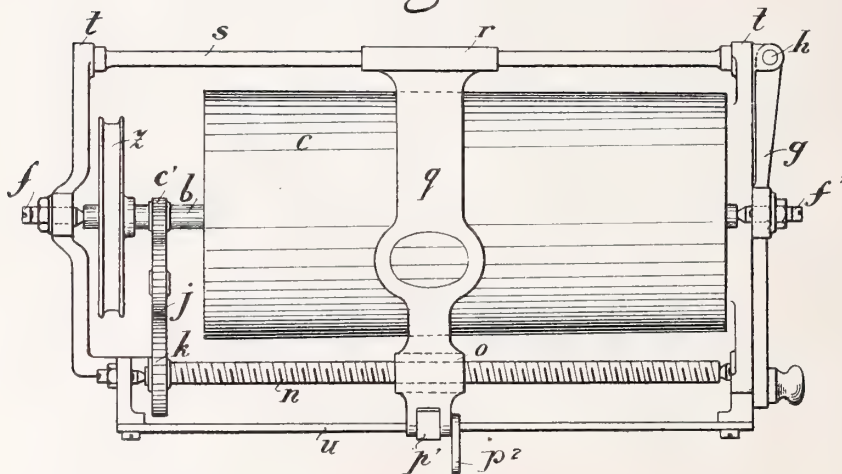
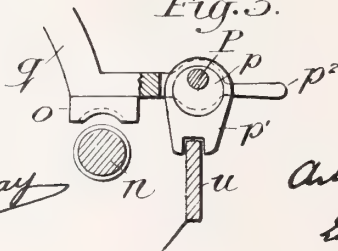


Fig. 3.



Witnesses:

Foran
Henry Delaunay

Inventors:

Arthur Grelet
Lucien Vives

UNITED STATES PATENT OFFICE.

ARTHUR GRELET AND LUCIEN VIVES, OF PARIS, FRANCE.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 649,725, dated May 15, 1900.

Application filed November 16, 1899. Serial No. 737,171. (No model.)

To all whom it may concern:

Be it known that we, ARTHUR GRELET and LUCIEN VIVES, citizens of the Republic of France, residing at Paris, France, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

Our invention relates to phonographs of that class which are provided with means for releasing the nut of the carrier for the recorder or reproducer from the feed-screw, so that the said parts can be returned to starting position by hand.

The invention consists of certain features of construction and combinations of parts to be hereinafter described and then claimed.

In the accompanying drawings, Figure 1 is a sectional end view of a phonograph provided with our invention. Fig. 2 is a plan view; and Fig. 3 is an enlarged detail view of the nut-disengaging device, the nut being shown in disengaged position and the other parts accordingly.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, *a* indicates the frame, and *b* the shaft of the drum *c*, over which the records are placed, which shaft journals at the ends on the points of two screws *f f'*. The screw *f'* is mounted on an arm *g*, pivoted at *h* to the frame, so that the said arm may be swung to one side in order to permit the removal of or the insertion of a record. Pulley *z* is arranged on the shaft *b*, so that the desired motion-transmitting device, either mechanical or electrical, may be applied.

q indicates the carrier for the membrane, which at one end is provided with a box or sleeve *r*, that is guided loosely on a fixed guide-rod *s*, fixed at *tt* to the frame *a* and arranged parallel with the shaft *b* of the record-drum *c*. *n* indicates a suitable feed-screw journaled in suitable bearings at the opposite side of the drum *c* from guide-rod *s* and also parallel therewith. Said carrier *q* spans the upper part of the drum *c* and is provided with a half-nut *o* at its forward end, which nut meshes with said feed-screw during the playing of a record and which feed-screw is

turned by intermeshing toothed wheels *c', j*, and *k*. The nut *o* may be released from the feed-screw *n* in order to permit the carrier *q* to be moved back to starting position. For this purpose a guide-rail *u* is fixed to the frame *a* in front of and parallel with the feed-screw, while the carrier is extended over the said rail and provided with bearings for a short pivot *P*, on which is mounted an eccentric cam *p* and which is also provided with a handle *p'*, whereby the cam may be turned. On the cam is mounted loosely a runner-shoe *p'*, so that the cam may turn therein, the lower end of said runner-shoe resting and being always guided on said rail *u*, except when it is desired to swing the carrier away from the record-drum. When the nut is in engagement with the feed-screw, as shown in Fig. 1, the cam and its handle are in the position shown; but when the record has been played and it is desired to return the carrier the handle *p'* and the cam *p* are moved down into the position shown in Fig. 3, so that the nut *o* is released from the feed-screw and the stylus disengaged from the record, the runner-shoe remaining on the rail *u*, so as to guide and support the carrier. The described disengaging and guiding means serves to insure a steady motion of the carrier during both directions of movement thereof.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

In a phonograph, the combination of the feed-screw for the carrier, the carrier provided with a half-nut, a guide-rail adjacent to the feed-screw, a cam pivoted in the forward end of the said carrier and provided with a handle, and a runner-shoe in which said cam turns, said runner-shoe resting and running on said guide-rail, substantially as set forth.

In testimony that we claim the foregoing as our invention we have signed our names in presence of two subscribing witnesses.

ARTHUR GRELET.
LUCIEN VIVES.

Witnesses:

FERNAND VOROU,
HENRY DELANNAY.

No. 650,188.

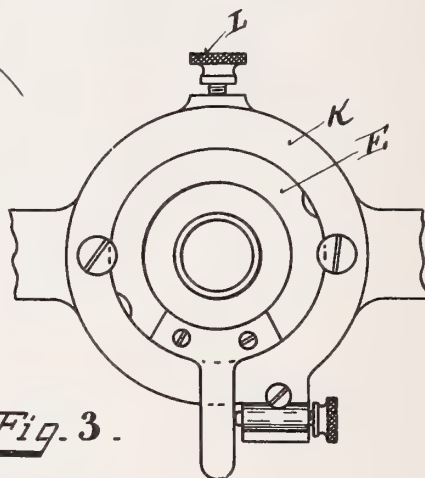
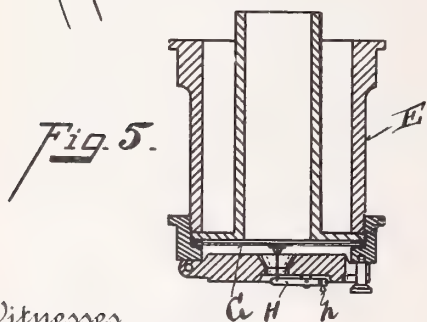
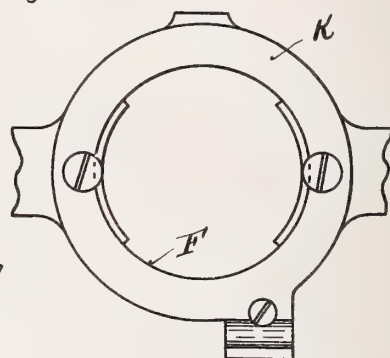
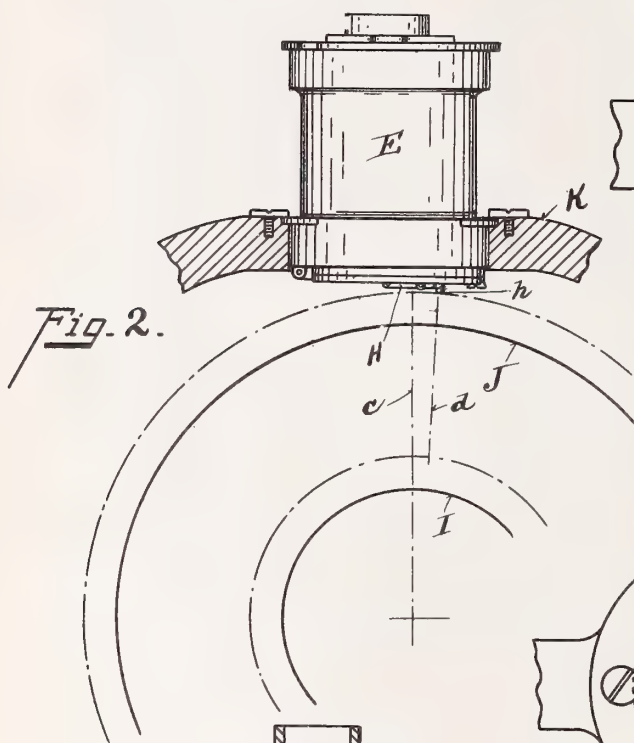
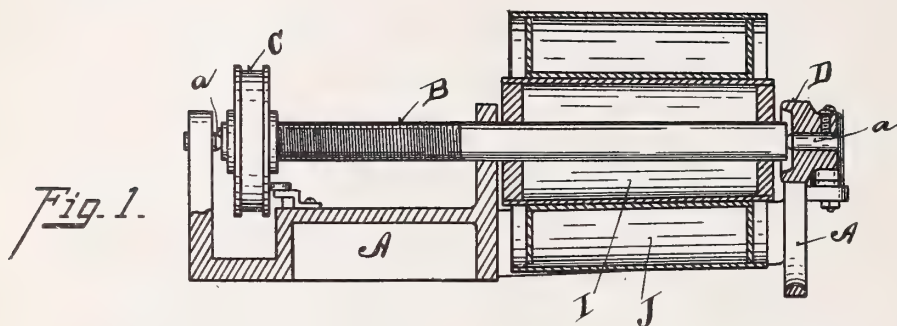
Patented May 22, 1900.

J. OERTLY.

PHONOGRAPH.

(Application filed Nov. 13, 1899.)

(No Model.)



Witnesses
Oliver B. Haier.
C. W. Miles.

Inventor
John Oertly
by Wood, Bond & Wood,
 Attorneys.

UNITED STATES PATENT OFFICE.

JOHN OERTLY, OF CINCINNATI, OHIO.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 650,188, dated May 22, 1900.

Application filed November 13, 1899. Serial No. 736,777. (No model.)

To all whom it may concern:

Be it known that I, JOHN OERTLY, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Phonographs, of which the following is a specification.

One object of my invention is first to provide an improved diaphragm-holder which may be adjusted to any desired size of record-cylinder of the ordinary form of phonographs.

A second object of my invention is to provide means for combining mandrels of different sizes, so that the same machine may employ either the small or larger sized cylinders or records, the machine being readily convertible from the large to the small size, or vice versa, at the pleasure of the operator.

The other features of my invention will be more fully set forth in the description of the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a central section of the frame, showing the two-sized mandrels in position. Fig. 2 is an elevation of the diaphragm-holder and section of diaphragm-holder arm, with a diagram illustration of the records. Fig. 3 is a top plan view of the diaphragm-holder and its holder-arm. Fig. 4 is a top plan view of the diaphragm-holder arm. Fig. 5 is a central section of the diaphragm-holder.

In the accompanying drawings the frame of the ordinary phonograph is employed and only so much therein shown as is necessary to show the improvements herein added.

A represents the frame of such machine; B, the mandrel or main shaft, provided with the ordinary driving-pulley C. It is supported on the centers *a* in the usual manner.

D represents the swinging center arm, which is operated to expose the end of the mandrels for the purpose of interchanging mandrels and putting on and taking off records. These parts are of ordinary construction.

E represents my improved diaphragm-holder, which is seated in the seat formed by the annulus F of the supporting-arm K. This diaphragm-holder is preferably made of a

tubular or barrel formation, with the diaphragm G attached near the bottom end of said tube, as shown in Fig. 5; but the location of said diaphragm G in the cylinder is not very important. It may be raised or lowered, as desired.

H represents the recording or reproducing arm, carrying the stylus-point *h*. These parts are of ordinary construction.

In the accompanying drawings, I represent the smaller ordinary mandrel, which is slightly tapering longitudinally. On the periphery of this cylinder is shown mounted a large mandrel J. The inner periphery of this large mandrel is in frictional engagement with the outer periphery of the smaller mandrel, which frictional engagement is sufficient to hold the outer mandrel firmly in position to receive a record or a record-tube, as the case may be. Other means may be employed for holding the two mandrels together; but for all ordinary purposes the frictional contact is sufficient.

In the operation of a phonograph, either for making a record or in reproducing sounds of a previous record, it is essential that the stylus should be a little at one side of the center, so as to obtain a sensitive result. In Fig. 2 the dotted lines *c* represent the vertical line through the axis of both mandrels. Dotted lines *d* represent the path of a stylus-point. In order to secure the proper position for this stylus in its engagement of different-sized mandrels, the diaphragm-holder E must be journaled in the annulus of its holder-arm at an inclination to the vertical line *c*. This inclination is such that the stylus-point after the diaphragm-holder is adjusted will be on the line *d* and at one side of the vertical line *c*. Thus I am enabled to employ any-sized mandrel and secure the proper and positive adjustment of the stylus-point to its mandrel.

L represents a set-screw tapping through the annulus of the holder, the point of which engages with the periphery of the diaphragm-tube and secures it in the proper position.

Having described my invention, I claim—
1. In a phonograph, a supporting-arm hav-

ing a seat, an elongated diaphragm-holder, and means for securing said diaphragm-holder in said seat in different positions substantially as described.

- 5 2. In a phonograph, a supporting-arm having a seat formed thereon, an elongated diaphragm-holder, and means for securing said diaphragm-holder in different positions in said

seat at an angle to the vertical line, substantially as described. 10

In testimony whereof I have hereunto set my hand.

JOHN OERTLY.

Witnesses:

OLIVER B. KAISER,
STEPHEN E. CONE.

No. 650,409.

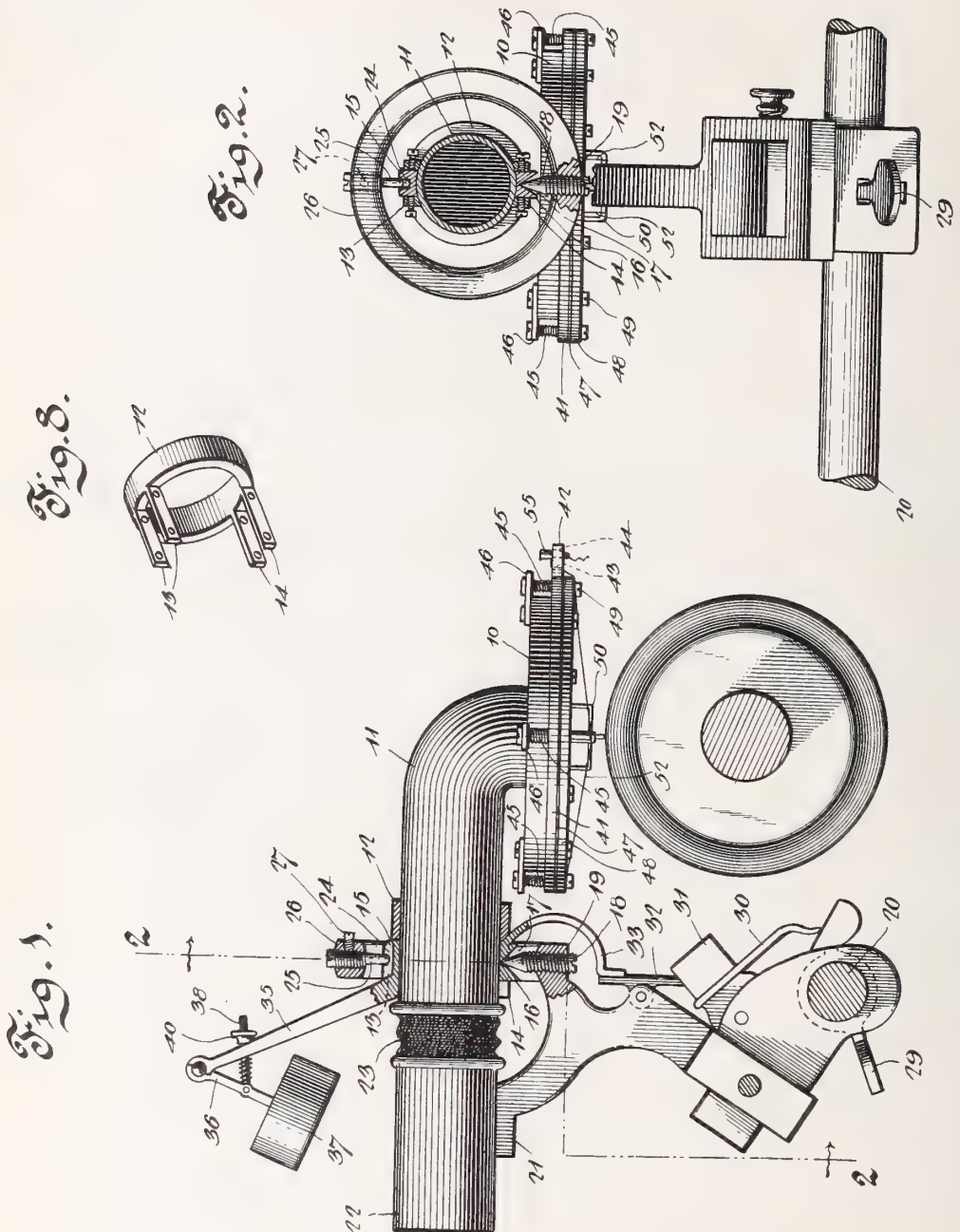
Patented May 29, 1900.

D. L. MINIER.
GRAPHOPHONE REPRODUCER AND RECORDER.

(Application filed Nov. 10, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
G. Kaufleuerwell,
Geo. H. Chandler.

By his *David L. Minier,* Inventor.
Attorneys,

C. A. Snow & Co.

No. 650,409.

Patented May 29, 1900.

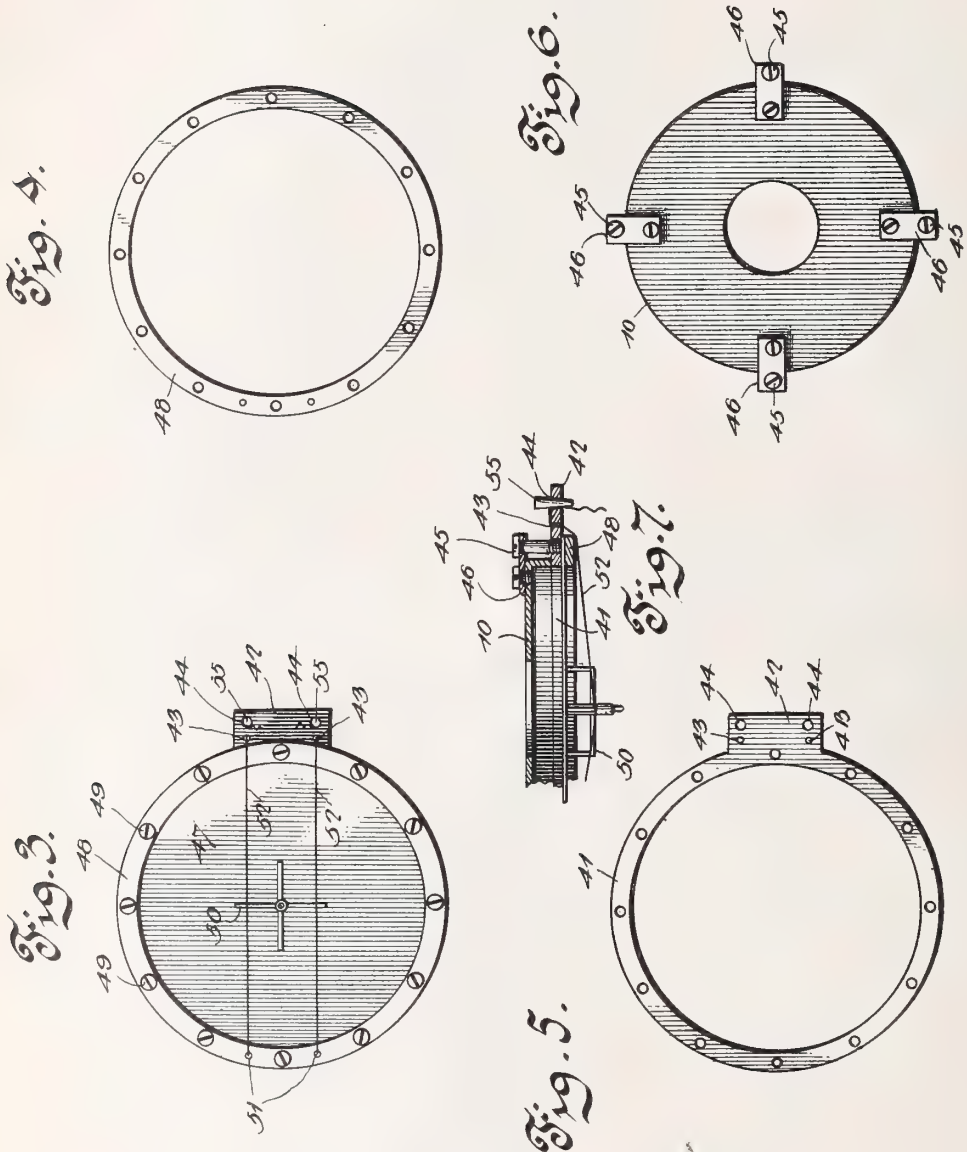
D. L. MINIER.

GRAPHOPHONE REPRODUCER AND RECORDER.

(Application filed Nov. 10, 1899.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses

J. Frank Leubnerwell. By his
G. C. Chandler.

David L. Minier, Inventor.

Attorneys.

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

DAVID L. MINIER, OF ITHACA, NEW YORK.

GRAPHOPHONE REPRODUCER AND RECORDER.

SPECIFICATION forming part of Letters Patent No. 650,409, dated May 29, 1900.

Application filed November 10, 1899. Serial No. 736,614. (No model.)

To all whom it may concern:

Be it known that I, DAVID L. MINIER, a citizen of the United States, residing at Ithaca, in the county of Tompkins and State of New York, have invented a new and useful Graphophone Reproducer and Recorder, of which the following is a specification.

This invention relates to graphophones in general, and more particularly to the reproducers thereof; and it has for one object to provide a construction in which the sound-box will be supported in a manner to hold the stylus lightly in engagement with the record and to permit adjustment of the sound-box to correspondingly move the stylus transversely or peripherally of the record.

A further object of the invention is to provide means for raising and lowering the sound-box and also to provide means for varying the tension of the diaphragm.

In the drawings forming a portion of this specification and in which similar numerals of reference designate like and corresponding parts in the several views, Figure 1 is a side elevation of the sound-box with the horn and the supporting-bracket, portions of the bracket being in section, and showing also the end of a record. Fig. 2 is a section on line 2 2 of Fig. 1. Fig. 3 is a bottom plan view of the sound-box. Fig. 4 is an elevation of the ring by means of which the diaphragm is clamped to the sound-box. Fig. 5 is the upper ring, against which the diaphragm is clamped. Fig. 6 is a top plan view of the sound-box with the sound-tube removed and with the diaphragm-clamping ring omitted. Fig. 7 is a partial central section of the sound-box, taken through one of the plugs for holding the tension-cord. Fig. 8 is a perspective view of the collar, which is slidably mounted upon the sound-tube.

Referring now to the drawings, the present invention comprises a sound-box 10, to the upper face of which is fixed an L-shaped sound-tube 11, having a collar 12 fixed thereon and through the medium of which the tube and box are supported.

The collar 12 has two oppositely-disposed pairs of arms 13 and 14, having threaded perforations for the reception of clamping-screws, which are adapted for engagement with blocks 15 and 16.

The block 16, which is disposed at the under side of the sound-tube, has a conical recess 17 therein, in which is disposed the conical end of a screw 18, which is passed through a threaded opening in an arm 19 of the box-supporting bracket. This bracket is mounted on a shift-rod 20 in the usual manner and at its upper end has a second arm 21, to which is fixed the end 22 of the horn. The horn is connected with the sound-tube 11 by means of an elastic tube-section 23, so that the sound-box and sound-tube may have movement independently of the horn.

In order to permit movement of the sound-box toward and away from the record and longitudinally thereof, the block 15, which is disposed upon the upper surface of the sound-tube, has a slot 24, which extends longitudinally of the tube and in which is disposed the end of a pin 25, having threaded engagement with a ring 26, formed integral with the arm 19 and encircling the sound-tube. The pin 25 is adapted for adjustment in the ring 26 and may be held against movement by means of a set-screw 27.

In order to raise and lower the sound-box, a lever 29 is mounted upon the rod 20 and bears at its opposite end against a finger 30, fixed to a rocker 31, which is pivoted to the box-supporting bracket, as shown in Fig. 1. Against the rocker 31 lies one end of a rock-lever 32, lying in slidable contact with the end of an arm 33, which is secured to the collar 12. Thus when the finger-piece 29 is depressed the arm 33 will swing upwardly and will raise the stylus from the record.

Attached to the block 15 and extending upwardly and rearwardly therefrom is an arm 35, pivoted to the upper end of which is a pendant 36, having a weight 37 at its free end. A threaded rod 38 is pivoted to the pendant 36 and is passed through a perforation in the arm 35, this rod 38 having an encircling helical spring disposed between the pendant and the arm and having also a thumb-nut 40 upon its free end and which nut is adapted to be screwed upon the rod to impinge the arm 35 and draw the weight in the direction thereof. When the nut is turned rearwardly, the helical spring is released and the weight swings outwardly. With this structure it will be seen that by manipulation of the thumb-nut

the weight may be caused to counterbalance the weight of the sound-box or that it may be adjusted to that position to secure the most effective pressure of the stylus against the record.

Secured to the lower open end of the sound-box 10 is a clamping-ring 41, the diameter of which is somewhat greater than that of the sound-box, and which ring has a radially-extending plate 42, provided with perforations 43 and 44, for a purpose to be presently explained. The ring 41 is secured to the sound-box through the medium of attaching-screws 45, passed through plates 46 and into the ring 41, these plates being secured to the upper face of the sound-box, as shown in Fig. 6.

Against the under side of the ring 41 is disposed a diaphragm 47, of sheepskin or other suitable material, and which is held in place by means of a clamping-ring 48, which is held against the ring 41 through the medium of clamping-screws 49, as shown. The diaphragm is stretched tight before the plate 48 is firmly clamped, and means are provided for further increasing the tension. This tension device consists of a double bridge 50, comprising two U-shaped bars mutually connected at their webs and the ends of which bars are disposed to engage the lower surface of the diaphragm at equidistant points. Pins 51 are secured in the ring 48 at points diametrically opposite to the extension 42 of the ring 41, and to these pins are secured cords or wires 52, which are passed transversely of the diaphragm and mutually parallel and then through the openings 43 of the plate 42, after which they are returned through the openings 44. The cords or wires 52 engage one of the webs of the double bridge, and thus by drawing upon the wires or cords 52 the fingers of the bridge are forced against the diaphragm, causing it to bulge inwardly and correspondingly increasing its tension. By this means the tension of the diaphragm may be brought to the desired point, and when this degree of tension has been secured plugs 55 are driven into the perforations 44 and act to hold the cords against retraction.

What is claimed is—

1. In a graphophone, the combination with a supporting-bracket of a collar pivoted to the bracket for rocking movement in one direction and for oscillation at all points of its rocking movement in planes at right angles to its direction of rocking movement, a sound-box slidably mounted in the collar, and a counterbalancing-weight connected with the collar.

2. In a graphophone, the combination with a supporting-bracket, of a sound-box having a tube pivotally connected with the bracket, a second tube fixed to the bracket, a flexible tube connecting the first-named tubes, and a counterbalancing-weight for the sound-box, connected therewith and adapted to vary the pressure upon the record.

3. In a graphophone, the combination with

a supporting-bracket, of a sound-box comprising a sound-tube, blocks adjustably connected with the tube, a pivot-bearing in one of the blocks, a slot in the second block, a pivot-screw carried by the bracket and engaging the pivot-bearing, and a pin carried by the bracket and engaging the slot to permit vertical and horizontal movement of the sound-box.

4. In a graphophone, the combination with a supporting-bracket, of a sound-box comprising a sound-tube, a block connected with the tube and having a pivot-bearing, a slotted block connected with the tube, a pivot carried by the bracket and engaging the pivot-bearing, and a pin carried by the bracket and engaging the slot.

5. A sound-box having a diaphragm connected therewith, a bridge engaging the diaphragm and comprising U-shaped bars disposed with their webs at right angles and with their extremities in engagement with the diaphragm, cords engaging a bar of the bridge and the box for pressing the bridge against the diaphragm, and means for varying the tension of the cords to vary the pressure of the bridge against the diaphragm and alter its tension.

6. The combination with a sound-box having a radially-extending portion, of a diaphragm clamped upon said portion, a perforated plate fixed to the box, a bridge disposed upon the diaphragm, cords fixed to the box and passed through the perforations of the plate, said cords being adapted to be drawn to increase the tension of the diaphragm, and pegs engaging the perforations and the cords therein and adapted to hold the cords against displacement.

7. In a graphophone, the combination with a record and a bracket adjacent thereto, of a support pivoted to the bracket, a sound-box having a sound-tube slidably connected with the pivoted support for movement transversely of the periphery of the record, and a counterbalancing-weight connected with the support, said box being movable with the support at an angle to the axis of the record.

8. The combination, in a graphophone, of a record, a supporting-bracket adjacent the record, a support pivoted to the bracket for rocking movement toward and away from the record, and for oscillation at all points of its rocking movement in planes parallel with the axis of the record, a box carried by the support, a counterbalance for the box, a sound-tube mounted upon the bracket and a flexible tube connecting the sound-tube and the sound-box.

9. In a graphophone, the combination with a bracket comprising two arms, of a sound-tube fixed to one of the arms, a support pivotally mounted in the second arm, a counterbalancing-weight adjustably connected with the support, a sound-box carried by the support and a flexible tube connecting the sound-box and the sound-tube.

10. In a graphophone, the combination with
a bracket and a support pivotally mounted
therein, of a sound-box mounted upon the
support and comprising a tube, a collar fixed
5 to the tube, arms carried by the collar and
adapted for adjustable connection with the
support, a fixed tube having flexible connection
with the first tube, and a counterbalancing-
weight adjustably connected with the
10 support.

11. A sound-box having a diaphragm connected therewith, a bridge engaging the diaphragm, a stylus mounted upon the bridge,

15 cords engaging the bridge and the box, and means for varying the tension of the cords to vary the pressure of the bridge against the diaphragm and alter the tension of the diaphragm.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in 20 the presence of two witnesses.

DAVID L. MINIER.

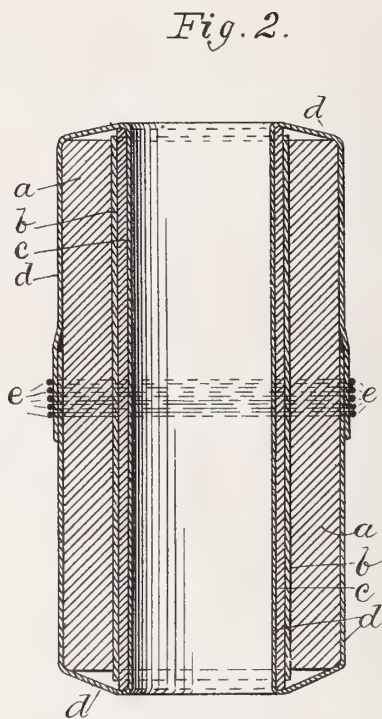
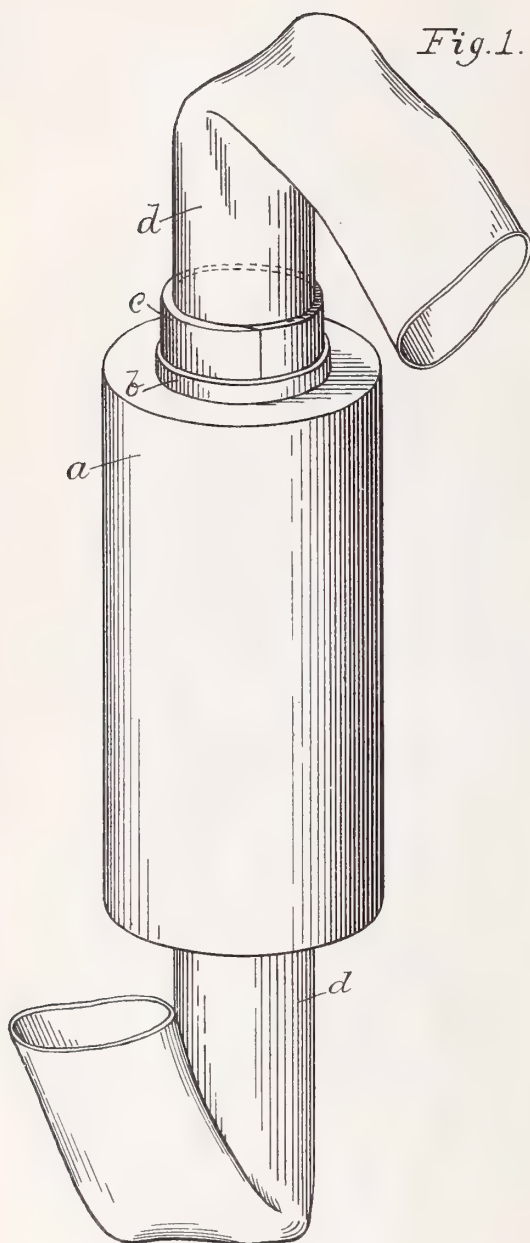
Witnesses:

C. E. HELM,
MILDRED MINIER.

G. H. STEVENS.
PROCESS OF DUPLICATING PHONOGRAMS.

(Application filed Feb. 2, 1899.)

(No Model.)



WITNESSES:

David C. Walter
L. E. Brown

INVENTOR:

George H. Stevens,
By Arthur Hall
His atty.

UNITED STATES PATENT OFFICE.

GEORGE H. STEVENS, OF TOLEDO, OHIO.

PROCESS OF DUPLICATING PHONOGRAMS.

SPECIFICATION forming part of Letters Patent No. 650,431, dated May 29, 1900.

Application filed February 2, 1899. Serial No. 704,232. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. STEVENS, a citizen of the United States, residing at Toledo, Lucas county, Ohio, have invented a certain new and useful Process of Duplicating Phonograms, of which the following is a specification.

In the reproduction of cylindrical sound-records for phonographs and analogous machines the results have proved unsatisfactory, owing to the soft and frail nature of the material employed. It is found that these records are easily scratched, defaced, marred, or broken, that they wear out quickly, and are not convenient for shipping unless extraordinary care is taken in packing them. To obviate these objections, I duplicate the record upon material that is so hard, tough, and flexible that it will take an impression only under hydrostatic or some other very high pressure. It is also found that the duplication of these cylinders is slow, laborious, and expensive and that their efficiency is diminished with each successive reproduction from the original. These difficulties and objections are due to the fact that heretofore no successful method has been devised for forming upon a seamless cylinder of hard tough resisting material a perfect cast or impression from a seamless mold or matrix containing the sound-record, because the withdrawal of such cast or impression from a seamless matrix would break down and destroy the delicate wave-lines of the sound-record either in the matrix or the reproduction, or both.

My invention relates to and one object is by the method or process hereinafter described to provide a seamless cylindrical duplicate of a cylindrical phonogram or sound-record, which record may be composed of hard tough resisting material, to prepare the same from a seamless matrix, and to make these reproductions in such manner that the matrix may be used over and over indefinitely without apparent deterioration.

The further object of my invention is to provide phonograms of the character described which shall be effective, cheap, light, durable, capable of being roughly handled without breaking or spoiling the same, and capable of being packed or nested in very small compass either by constructing the

same in slightly-conical form or in cylinders of various diameters.

To this end the first step in my process consists in electrically depositing upon and around the usual cylindrical wax record an electrotpe matrix or mold, first depositing a thin shell of nickel upon the wax and then depositing upon this a heavy shell of copper, the purpose of the nickel being to give to the interior face of the matrix a smooth surface that does not easily tarnish, that is harder than copper, and that will produce a higher polish upon the surface of the phonogram or record that is afterward pressed therein. Now from this matrix or mold the substance of which the original record is formed is entirely removed by melting or otherwise. The second step in my process is to introduce into the hollow of the matrix a thin closely-fitting cylinder of any hard tough resisting material having sufficient flexibility to allow it to bend without breaking. In practice I prefer celluloid. Sheet-celluloid may be readily obtained in the markets as thin as one one-hundredth of an inch and should be formed into thin flexible cylinders without joints or seams and of the proper diameter. If the finished and perfect cylinder-blanks cannot be readily obtained, they may be formed out of flat celluloid sheets cut of proper size to make a blank cylinder having a lapping joint of, say, one-eighth of an inch, more or less. The lapping surfaces when moistened with alcohol or ether will soften sufficiently to readily and firmly unite with each other when dry, and these edges when dried under pressure are smoothly and perfectly welded. Any unevenness or exposed edge may be readily dressed off in a lathe to a smooth and even surface, leaving the exterior surface of the cylinder without break or seam. Into this thin flexible cylinder is inserted a closely-fitting thin spring-brass cylinder longitudinally cut or split along one of its sides. When the edges of this piece are brought together, the outer surface is smooth and has the contour of the cylinder. When one of the edges is pressed inwardly out of line, the piece may be collapsed somewhat, so that it may readily be withdrawn from the cylinder. The celluloid blank, with its metal backing, is now slipped into the matrix or mold, which exactly fits the blank when in

place. I provide the matrix and its contents with a flexible water-tight jacket or covering. This may be conveniently accomplished by drawing through the hollow of the inner brass cylinder a piece of soft-rubber tubing considerably longer than the matrix and then turning the ends of the tube backward upon the outside of the matrix, so that the ends of the soft-rubber tubes are turned inside out and overlap each other. The rubber envelop thus formed may be secured against leak by winding with wire the overlapping portions of the tube or by clamping the same with a suitable band. I next subject the matrix and its contents to hydrostatic pressure. To accomplish this, I prefer to use a hydraulic "gun," which consists of a chambered piece or pieces of suitable metal constructed of necessary strength and having its chamber connected with a hydraulic pump of the required power. The hydraulic gun is also provided with a steam-jacket properly connected for heating the gun and its contents. In the chamber of this gun liquid-pressure is always uniform in all directions, and great compression may be obtained upon anything that may be contained therein when the interior of the object to be compressed is properly protected from access of the liquid employed in the gun. The matrix (or several of them) and its contents, inclosed in the water-tight flexible envelop, are placed inside the hydraulic gun, which is suitably closed and filled with water or other liquid. The contents of the gun are now subjected to hydrostatic pressure, which acts equally in all directions upon the soft-rubber covering. Its effect, therefore, is to force the rubber against the spring-brass cylinder and the spring-brass cylinder against the celluloid blank, which in turn is compelled to expand slightly, and is thus forced against the interior face of the matrix. There will now be embossed or molded or stamped on the surface of the celluloid the reverse impression of the matrix itself, thus producing an exact duplicate of the original wax record. Although the spring-brass backing may be omitted, better results are obtained from its use. The office of the spring-brass cylinder is to firmly apply the liquid-pressure to the celluloid blank with a less yielding face than would be the case if the pressure were applied directly to the rubber and celluloid. It will be seen that by reason of the liquid-pressure in the gun acting equally and uniformly in all directions, and as the external and internal pressure on the matrix is the same, the matrix is preserved from crushing, breaking, or distortion. To further assist the process of pressing, as soon as a light pressure of, say, two thousand pounds to the square inch has been applied steam is allowed to fill the steam-jacket until the gun and its contents are well heated. This causes the blank of celluloid or the like to become in consequence more plastic and yielding than when cool, and it will under this condition mold

easier when the heavier pressure is later applied. As soon as the blank has become hot further pressure is applied to the gun by the hydraulic pump. The steam when properly manipulated through the jacket will then by expansion increase the pressure within the gun until the registering-dial will indicate, say, from fifteen thousand to fifty thousand pounds pressure per square inch. The former figure is generally sufficient for a fair effect; but the nearer the latter figure is approached the more satisfactory are the results. The time necessary for the entire operation of pressing occupies usually from one to two hours. When a proper pressure has been exerted for a sufficient time, the steam is turned off from the steam-jacket, which allows the contents of the gun to cool and contract somewhat, thus lowering the pressure. Now the pressure should be kept up by the pump until the gun and its contents have become cooled, for in embossing and pressing compositions under heat best results are obtained by allowing the material to become cool while yet under full pressure. Instead of employing a hydraulic gun in the pressing process the matrix may be made very strong and provided with means for capping or sealing its ends hermetically, the whole being constructed to withstand a sufficient interior pressure without a corresponding exterior one. This matrix should be provided with a steam-jacket, and inside of the matrix should be a rubber bag attached to the hydraulic connection, so that when the liquid-pressure is applied moisture will be excluded from the interior of the matrix, the cylinder, and the cylindrical spring-brass backing. This device is, however, the obvious mechanical equivalent of the gun or any other means of obtaining interior hydrostatic pressure upon the cylinder. As only comparatively-low pressures can be employed in the modification here suggested, the use of the gun above described is much to be preferred. When sufficiently cool, the chamber of the gun is opened and the matrix and its contents are taken out. The wire or band is now removed from the outside of the rubber (the rubber being stripped off readily, as its adhesion is but slight) and the spring-brass cylinder is collapsed and removed, as above indicated. The inner face of the matrix will be found to have a lining of celluloid or the like firmly and uniformly embedded upon its face, which lining is quite flexible. Now if a stiff blunt small steel wire or other suitable instrument is carefully inserted between the celluloid cylinder and the matrix itself the side of the flexible cylinder can be sprung inwardly, thus reducing the exterior circumference of the cylinder, which permits the cylinder to be readily detached and withdrawn from its matrix or mold without injury to either the mold or the phonogram. It will be seen that from a seamless matrix or mold has been constructed and embossed or stamped a seamless

record of practically indestructible material, having on its surface an exact reverse impression of the matrix and having such a sharp distinct impression as will cause the usual needle and diaphragm of a talking-machine of the type in question to respond in exactly the same manner as do the original common wax records when new. The thin flexible phonogram, which may, if wished, be formed somewhat tapering, is now slipped onto a suitable hollow mandrel or holder properly constructed for the purpose, and, if desired, may be securely fastened there by some adhesive substance, though preferably I employ a rigid hollow mandrel with a slightly-tapering exterior surface upon which the record may be crowded tightly, said mandrel having an interior face, also slightly tapering, but with a suitable diameter and taper to fit snugly over the usual mandrels with which the various types of talking-machines are usually supplied. The thin flexible record is now ready for use.

In the accompanying drawings, made part hereof, Figure 1 is an elevation of a matrix or mold, a blank and its backing of spring-brass, and a rubber tube in the course of being assembled to receive hydrostatic pressure; and Fig. 2 is a central sectional elevation of the same assembled ready for hydrostatic pressure.

In the drawings, *a* is the matrix or mold; *b*, the blank cylinder; *c*, the inner spring cylinder or backing, and *d* the elastic tube to form the water-tight jacket.

In Fig. 2, *e* represents the wire or band with which the backwardly-turned overlapping ends of the tube *d* are bound and compressed to make a water-tight joint.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The improvement in the process of forming a duplicate cylindrical phonogram of plastic material from an electrotpe-matrix, which consists in introducing into the plastic cylinder an expansible backing of solid material.

2. The improvement in the process of forming a duplicate cylindrical phonogram of plastic material from an electrotpe-matrix, which consists in introducing into the plastic cylinder an expansible backing of solid material,

then excluding moisture from the matrix and its contents, and then subjecting the backing of solid material to internal hydrostatic pressure.

3. The method or process of duplicating cylindrical phonograms which consists in forming a seamless electrotpe matrix or mold from the phonogram to be duplicated; then introducing into said matrix a flexible blank cylinder of hard, tough material having a solid backing separable therefrom, then excluding moisture from the face of the matrix, the blank and its backing, and then applying hydrostatic pressure to the interior of the blank and its backing, substantially as described.

4. The method or process of duplicating cylindrical phonograms which consists in forming a seamless electrotpe matrix or mold from the phonogram to be duplicated, then introducing into said matrix a hollow, blank cylinder having a separable solid backing, and then applying hydrostatic pressure to the interior of said backing, substantially as described.

5. The method or process of duplicating cylindrical phonograms which consists in forming an electrotpe seamless matrix from the phonogram to be duplicated, then introducing into said matrix a blank of hard tough flexible substance having a separable solid backing, then applying hydrostatic pressure to the interior of the blank and its backing, and then separating the matrix, the phonogram thus produced, and its backing, substantially as described.

6. The method or process of duplicating cylindrical phonograms which consists first, in forming an electrotpe seamless matrix or mold from the phonogram to be duplicated; second, introducing into said matrix a thin flexible blank cylinder having a suitable backing of solid material; third, excluding moisture from the face of the matrix and the blank; fourth, applying hydrostatic pressure to the interior of the blank and its backing, and fifth, separating the matrix, the phonogram thus formed, and its backing, substantially as described.

GEORGE H. STEVENS.

In presence of—

JOHN R. BOWLAND,
L. E. BROWN.

No. 650,526.

Patented May 29, 1900.

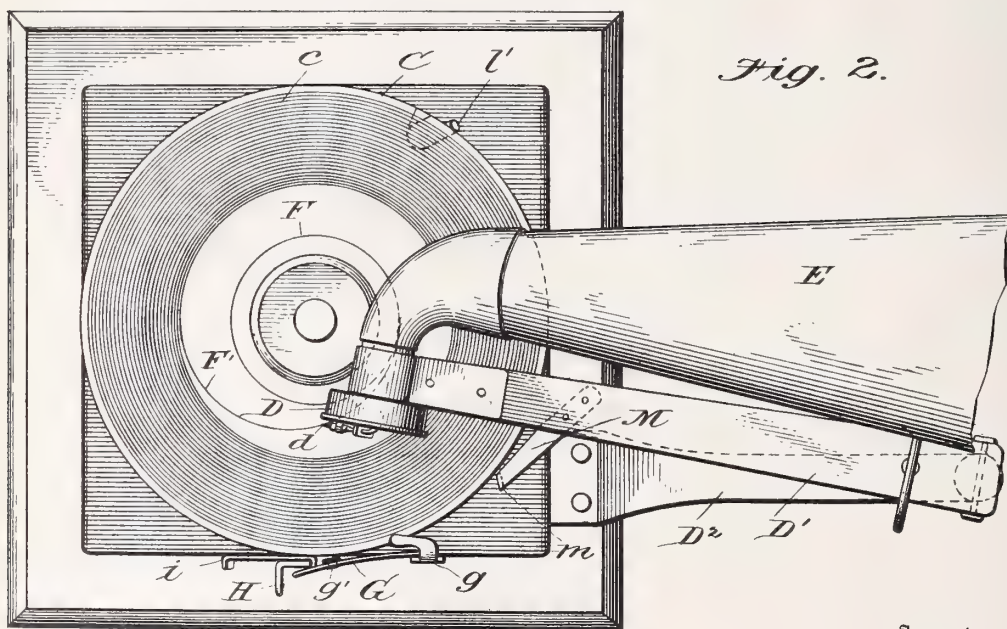
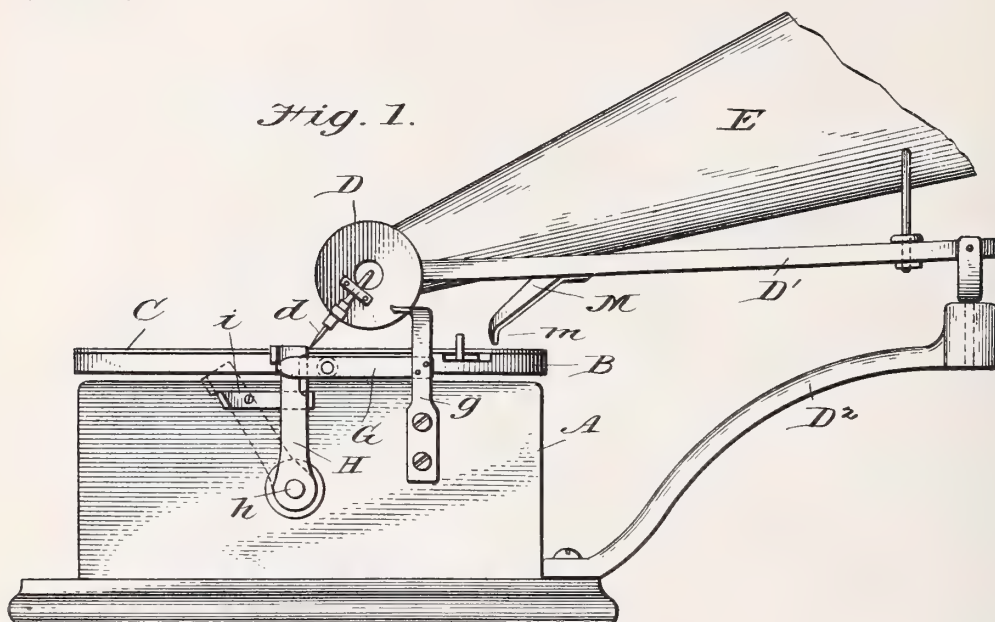
J. H. CROWELL.

AUTOMATIC STOP MECHANISM FOR SOUND REPRODUCING MACHINES.

(Application filed Feb. 27, 1899.)

(No Model.)

2-Sheets—Sheet 1.



Inventor

John H Crowell,
by /s/ H. C. P. /s/

Attorneys

Witnesses

J. F. Cross.
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No. 650,526.

J. H. CROWELL.

Patented May 29, 1900.

AUTOMATIC STOP MECHANISM FOR SOUND REPRODUCING MACHINES.

(Application filed Feb. 27, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.

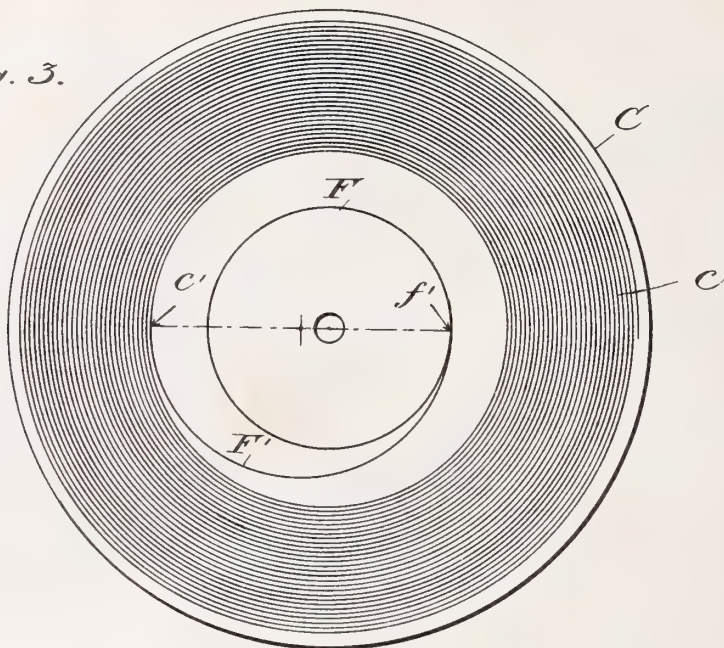
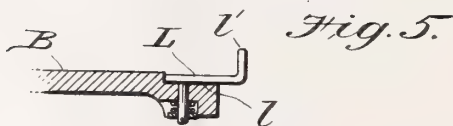
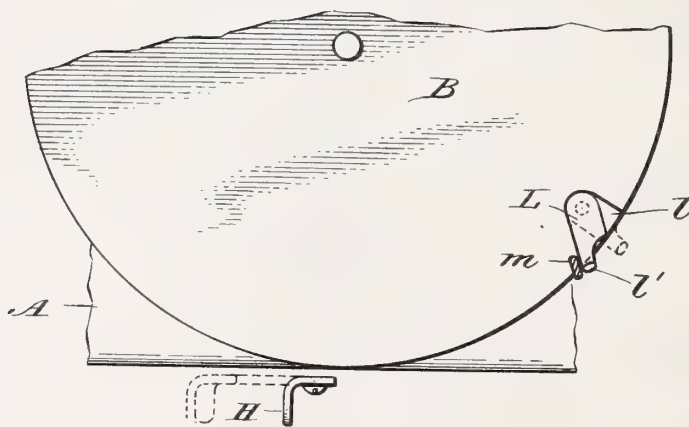


Fig. 4.



Witnesses

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Inventor

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his Attorney

UNITED STATES PATENT OFFICE.

JOHN H. CROWELL, OF VINEYARD HAVEN, MASSACHUSETTS, ASSIGNOR TO
THOMAS S. PARVIN, OF PHILADELPHIA, PENNSYLVANIA.

AUTOMATIC STOP MECHANISM FOR SOUND-REPRODUCING MACHINES.

SPECIFICATION forming part of Letters Patent No. 650,526, dated May 29, 1900.

Application filed February 27, 1899. Serial No. 706,986. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. CROWELL, a resident of Vineyard Haven, in the county of Dukes, State of Massachusetts, have invented an Improvement in Automatic Stop Mechanisms for Sound-Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to an improved automatic stop mechanism for sound-reproducing machines and is particularly adapted to machines using a flat circular record.

The object of my invention is to provide means for automatically stopping the operation of the machine immediately upon the completion of the reproduction, or, in other words, as soon as the stylus-point of the reproducer has traversed and reaches the terminus of the record-grooves.

The uses and advantages of my invention will be readily apparent from the following description, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of a gramophone-machine having my invention applied thereto. Fig. 2 is a plan view of the same. Fig. 3 is a plan view of one of the records detached from the machine. Fig. 4 is a detail view in plan of a section of the turn-table, illustrating the dog which releases the brake mechanism and also illustrating a portion of the machine-casing and the detent-lever for holding the brake. Fig. 5 is a detail section through a portion of the turn-table and the pivoted dog.

In the said drawings, A designates the outer casing of a machine of the gramophone type, which contains the usual motor mechanism for running the machine, and B is the revoluble turn-table, adapted to support a flat circular record C, such as are used on machines of this character.

D designates the reproducer, carried by a supporting-arm D', pivotally mounted on the bracket D², this arm D' also serving to support the horn E, which is fastened at its smaller end to the reproducer.

The record-disk C has on its upper surface the spirally-arranged record-grooves c, adapt-

ed to be engaged during the operation of the machine with the stylus-point d of the reproducer. These grooves c commence at a point near the periphery of the disk and recede spirally toward the center of the said disk, as clearly illustrated in Fig. 3 of the drawings, and stop at a point less than half the length of the radius of the disk, the length of the grooves varying, of course, according to the length of the matter recorded. A short distance inside the terminus of the grooves c I describe a circular groove F, drawn concentric with the axis of the disk. I then draw a line from the inner end of the groove c diametrically through the circular groove F, as c' f', bisect this line, and describe a curved groove F' from this center tangent with the points c' f', thus forming a continuous groove from the terminus of the spiral to the endless groove F for the purpose presently to be described.

On one side of the casing A, I provide an upwardly-extending arm g, to which is secured a spring brake-lever G, having a teat g' of leather or other suitable material adapted to bear against the periphery of the turn-table and serve as a brake to stop the same. A detent-lever H, pivoted at its lower end at h to the casing A, is provided, having its upper end provided with a wedge-shaped edge adapted to engage the free end of the brake-lever G and hold it away from contact with the turn-table B when the said lever is in the position shown in Figs. 1 and 2 of the drawings. A guide-plate i is secured to the casing A back of the lever H, having lugs or projections on its edges for limiting the lateral movement of the said lever H.

On the upper surface of the turn-table B, adjacent the periphery thereof, is a mortise l, adapted for the reception of a pivoted dog L, having an upwardly-extending projection l', projecting beyond the peripheral edge of the turn-table. One of the side walls of the mortise l slants outwardly toward the periphery of the turn-table, so as to allow the dog L to normally lie in the position shown in Fig. 4 of the drawings, with its projection l' close to the periphery of the record and turn-table, while the opposite wall is parallel with the edge of the dog when it is in the position

shown in dotted lines in Fig. 4 of the drawings and limits its movement in this direction.

Secured on the under side of the reproducer-supporting arm D' is an arm M, located at an angle—say about forty-five degrees, to the arm D' and extending downwardly, as shown in Figs. 1 and 2. The free end of this arm M is bent down, as at *m*, so as to reach just slightly above the plane of the record-disk C.

10 The operation of my device may be described as follows: The reproducer carrying the stylus is adjusted so that the said stylus rests in the beginning of the spirally-arranged grooves *c* and the detent-lever H is moved in
15 the position illustrated in Figs. 1 and 2, which throws back the brake G and holds it away from the periphery of the turn-table B, thus allowing the said turn-table and its record to revolve through the medium of the motor
20 mechanism contained in the casing A. The reproduction now commences, and the spirally-arranged grooves being in contact with the stylus-point *d* cause the supporting-arm D' to feed automatically in a lateral direction.
25 As soon as the terminus of the record-grooves is reached and the reproduction has been completed the stylus-point will enter and be guided by the groove F', which moves the arm D quickly in a lateral direction toward the
30 center of the disk C. This movement brings the projection *m* of the depending arm M in the path of the dog *l'* and throws the said dog as it comes in contact therewith to the position shown in dotted lines in Fig. 4, where it
35 is then in a position to engage the upper end of the detent-lever H and release it from engagement with the spring brake-lever G, the lever H assuming the position shown in dotted lines in Fig. 1 and the brake-lever G bearing
40 against the periphery of the turn-table B and stopping the same. When it is desired to start the machine again, the dog is returned to its normal position, and the reproducer is lifted and moved back to the initial position,
45 so that the stylus engages the beginning of the record-grooves, and the detent-lever H is thrown up to engage the brake-lever G and hold it away from contact with the turn-table, thus allowing the same to again revolve.
50 A number of slight changes in the construction and arrangement of the brake mechanism and its engaging parts might be made. Hence I do not desire to limit myself to the exact construction shown and described, but
55 hold that various modifications can be made without departing from the spirit and scope of my invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

60 1. A rotatable tablet having therein a groove capable of guiding the stylus of a talking-machine, one part of said groove being arranged in convolutions close together and
65 containing a sound-record, the other part diverging rapidly from said first part for the purpose set forth.

2. A record-disk having in its face a continuous groove capable of guiding the stylus of a sound-reproducer, said groove consisting
70 of a part arranged in a close spiral and containing a sound-record, a spiral part diverging rapidly from said close spiral and terminating in the third part, said third part consisting of a closed curve arranged about the
75 center of the disk.

3. In a sound-reproducing machine, the combination with a record having means for shunting the reproducer in a lateral direction after the reproduction is completed, a repro-
80 ducer-support, and mechanism connected with the reproducer-support adapted to automatically stop the machine immediately after the reproduction has been completed, substantially as described.

4. In a sound-reproducing machine, the combination with a revoluble record, a record-support, a brake mechanism for the said record-support, means for keeping the said
85 brake out of contact with the record-support during the reproduction, a reproducer-support, and trip mechanism carried by the said reproducer-support for automatically operating the said brake to stop the record immediately upon the completion of the reproduction
90 and the reproduction, substantially as described.

5. In a sound-reproducing machine, the combination of a record, means provided thereon for shunting the reproducer in a lateral direction after the completion of the re-
95 production, a brake adapted to bear against the record-support, means for holding the said brake out of contact with the record, a reproducer-support, and means connected with the reproducer-support for releasing the
100 said brake immediately upon the completion of the reproduction, substantially as described.

6. In a sound-reproducing machine, the combination with a revoluble record, means
105 provided thereon for shunting the reproducer in a lateral direction after its stylus has reached the terminus of the record-grooves, a brake adapted to bear against the record-support, mechanism for holding the said
110 brake away from contact with the record-support, a pivoted dog carried by the record-support adapted when thrown out to engage and release the brake-holding mechanism, a
115 reproducer-support, and means connected with the reproducer-support for throwing out said pivoted dog upon the completion of the reproduction recorded in the record-grooves, substantially as described.

7. The combination with the revoluble record, of means provided thereon for shifting
120 the reproducer laterally when the end of the record-grooves has been reached, a brake adapted to bear against the record turn-table, means for holding the brake normally out of
125 contact with the turn-table, a pivoted dog carried by the turn-table, a reproducer-support, a depending arm carried by the reproducer-support adapted to engage the pivoted dog and
130

throw it into a position to engage the brake-holding mechanism and release the brake when the reproduction has been completed, substantially as described.

5 8. The combination with the revoluble record, of a pivotally-mounted reproducer, means for shunting the said reproducer in a lateral direction after its stylus has reached the terminus of the record-grooves, a turn-table for
10 supporting the record, a brake adapted to bear against the record turn-table, a detent-lever adapted to hold the brake away from contact with the turn-table, a movable dog carried by the turn-table adapted when thrown out to en-
15 gage the detent-lever and release the brake, and a depending arm carried by the reproducer-support adapted to operate the movable dog when the said reproducer-support has been shifted laterally after the completion of
20 the reproduction, substantially as described.

9. The combination with a revoluble record having means provided thereon for laterally shifting the reproducer after its stylus has reached the terminus of the record-grooves,
25 of a depending arm, M, carried by the reproducer-support adapted when the said lateral movement takes place to engage and throw out a pivoted dog, L, a turn-table for supporting the record, a brake adapted to bear against
30 the turn-table, a detent-lever, H, adapted to hold the brake away from the turn-table, and the pivoted dog, L, adapted when thrown out to engage the detent, H, and release the brake, substantially as described.

35 10. The combination with the revoluble rec-

ord, of a reproducer-support, a reproducer carried thereby, a table carrying said record, a dog pivoted to the record-table near the periphery thereof, a projection, *l'*, extending
40 above the plane of the record, a brake, G, adapted to bear on the record-table, a detent, H, for holding the brake normally away from the record-table, and an arm, M, carried by the reproducer adapted to engage the projec-
45 tion, *l'*, and throw the dog, L, in the path of the detent, H, when the reproduction is completed, substantially as described.

11. The combination with the revoluble record, of a reproducer-support, a reproducer carried thereby, a table carrying said record, a
50 dog pivoted to said table and having a projection, *l'*, extending above the plane of the record, said table having a cut-out portion, *l*, for limiting the movement of the dog, L, a spring-brake, G, adapted to bear on the periphery of
55 the record-table, a detent, H, for holding the brake normally away from the record-table, a guide-plate, *i*, for limiting the movement of the detent, and a depending arm, M, carried by the reproducer-support adapted to engage
60 the projection, *l'*, and throw the dog, L, in the path of the detent, H, and release the brake immediately after the completion of the reproduction, substantially as described.

In witness whereof I have hereunto set my
65 hand this 21st day of February, A. D. 1899.

JOHN H. CROWELL.

Witnesses:

DENNIS SMITH,
E. ST. CROIX OLIVER.

No. 650,739.

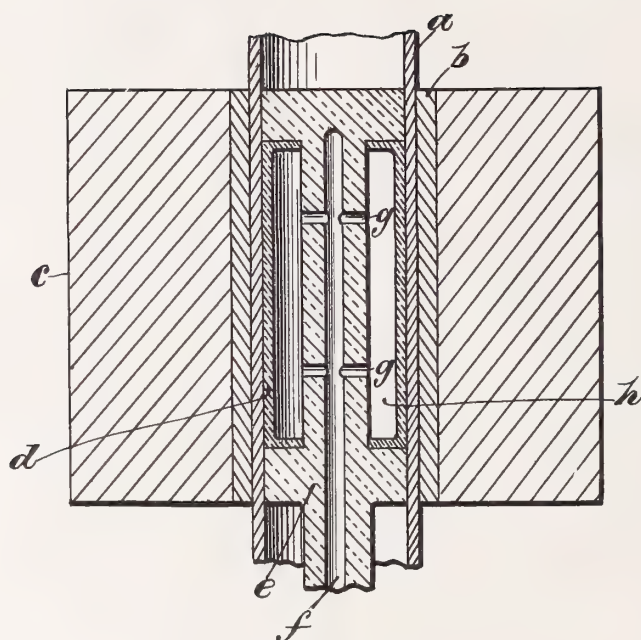
Patented May 29, 1900.

H. G. WOLCOTT.

METHOD OF DUPLICATING PHONOGRAPH RECORDS.

(Application filed Mar. 22, 1900.)

(No Model.)



Witnesses.
Robert G. Smith
J. M. Keefe

Inventor:
Henry G. Wolcott,
By James L. Norris
Att'y.

UNITED STATES PATENT OFFICE.

HENRY GOODRICH WOLCOTT, OF FISHKILL-ON-THE-HUDSON, NEW YORK.

METHOD OF DUPLICATING PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 650,739, dated May 29, 1900.

Original application filed July 25, 1899, Serial No. 725,060. Divided and this application filed March 22, 1900. Serial No. 9,780. (No model.)

To all whom it may concern:

Be it known that I, HENRY GOODRICH WOLCOTT, a citizen of the United States, residing at Fishkill-on-the-Hudson, in the county of Dutchess and State of New York, have invented a certain new and useful Improved Method of Manufacturing Phonogram or Gramophone or Phonograph Duplicates from a Negative of the Original Record, of which the following is a specification, which is a division of the invention contained in my application for Letters Patent filed July 25, 1899, Serial No. 725,060.

This invention relates to an improved method of manufacturing phonogram or gramophone or phonograph duplicates from a negative of the original record; and it consists in supporting within a negative bearing a cameo reproduction of the sound-waves taken from the surface of the original record a cylinder of plastic material or material capable of being rendered plastic by the application of a gentle heat and expanding or forcing the plastic cylinder circumferentially outward into intimate contact with the cameo face of the negative by the action of a fluid expanding agency within the plastic cylinder.

The invention also consists in exteriorly supporting a negative bearing a cameo reproduction of the sound-waves taken from the surface of the original record, a cylinder of plastic material or material capable of being rendered plastic by the application of a gentle heat, and expanding or forcing the plastic cylinder circumferentially outward into intimate contact with the cameo face of the negative by the action of a fluid expanding agency within the plastic cylinder.

In the accompanying drawing I have illustrated one form of apparatus suitable for carrying my invention into effect, in which said apparatus is illustrated in central longitudinal section.

I will describe my said improved method in connection with said illustrated apparatus, although I desire it distinctly understood that I do not confine my invention to such apparatus, as the same is not herein claimed, and various other means suitable for performing my improved method may be employed.

In carrying out my invention I take a hol-

low cylindrical negative *b*, which bears on its interior surface a reproduction in cameo of the sound-waves impressed or cut into the surface of the original record and support it exteriorly, as in a housing *c*, and either before or after said negative is introduced into the external cylinder-support *c* I place within said negative a cylinder or tube *a*, of plastic material or material capable of becoming plastic by the application of a gentle heat and which is preferably of vulcanite, celluloid, or the like, and within the plastic material is introduced a hollow piston *e*, having an elongated annular or circumferential recess which in longitudinal extent is coequal or greater than the surface of the negative on which the cameo reproduction of sound-waves is formed and which recess is covered with a flexible bag *d*, such as rubber, whereby an annular chamber *h* is formed. The piston is provided centrally with a longitudinal bore or passage *f* and lateral ports *g*, discharging into the annular chamber *h*. I conduct into said annular chamber through said bore and lateral ports a fluid expanding medium, preferably compressed air or liquid, which acts to force the bag *d* and plastic cylinder *a* evenly outward in all directions, pressing the latter evenly and gently into intimate contact with the cameo-worked face of the negative and forming in the external surface of said cylinder an exact and true intaglio reproduction of the cameo representations of the sound-waves possessed by the negative, and thus reproducing a true facsimile or exact duplicate of the original record.

The plastic cylinder *A* is preferably a little smaller in diameter than the internal diameter of the negative, and said cylinder on the reduction of the internal expanding pressure can be readily removed from the negative, owing to its yielding capacity and to the diametrical difference existing between the cylinder and the negative.

In order to secure the production of a duplicate record with merely a moderate internal pressure in the chamber *h*, either the negative or the plastic cylinder, or both, may be gently heated before they are placed into working position, so that the plastic cylinder, and especially its outer surface, will be capa-

ble of more readily taking an impression from the negative.

The step of externally supporting the negative, which is preferably an electro, is important to prevent any possible distortion of the negative and to hold the same firmly while the plastic cylinder to receive the intaglio impression is being forced into intimate contact therewith, and the action of the fluid expanding medium operates within the plastic-cylinder surface to force the same outward equally and gently in all directions into intimate contact with the interior worked surface of the negative, resulting in the production of a duplicate record which is a perfect facsimile of the original record. As many duplicates as may be desired may be manufactured in this way.

In the following clauses of the claim I use the term "plastic cylinder" as comprehending a cylinder of plastic material or material which may be rendered plastic by the application of heat, and said claims are drawn to comprehend the introduction of the plastic cylinder into the negative either before or after the latter has been arranged in its external support.

Having thus described my invention, what I claim is—

1. The improved method of manufacturing phonogram, gramophone or graphophone duplicates which consists in arranging a plastic cylinder in a negative having a cameo repro-

duction of the original sound-wave record, and introducing a fluid expanding agent within said cylinder to force the latter into intimate contact with the interior cameo-surface of the negative.

2. The improved method of manufacturing phonogram, gramophone or graphophone duplicates, which consists in supporting a negative having a cameo reproduction of the original sound-wave record, arranging a plastic cylinder therein, and expanding said plastic cylinder into intimate contact with the interior cameo-surface of the negative by a fluid expanding agent operating within said cylinder.

3. The improved method of manufacturing phonogram, gramophone or graphophone duplicates, which consists in exteriorly supporting a negative of the original record, introducing a plastic cylinder into said negative, and expanding said plastic cylinder into intimate contact with the interior surface of the negative by a fluid expanding medium acting within the cylinder, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HENRY GOODRICH WOLCOTT.

Witnesses:

H. D. JAMESON,
T. L. RAND.

No. 650,843.

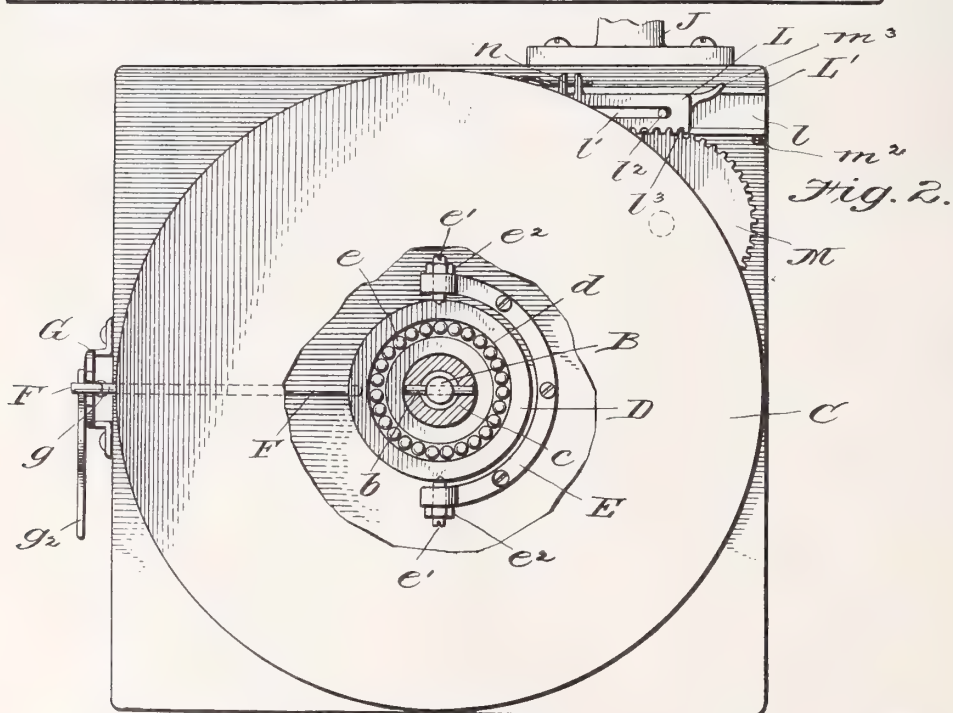
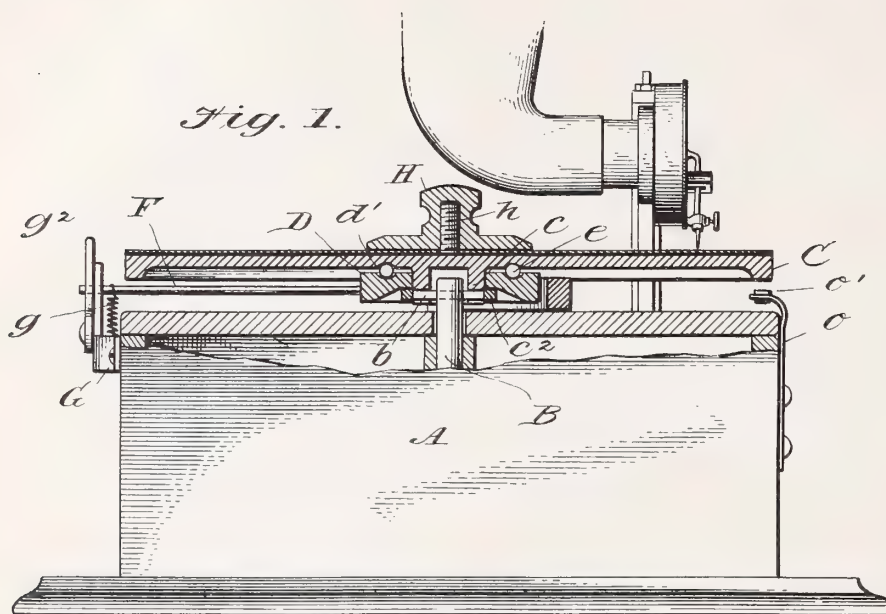
Patented June 5, 1900.

E. R. JOHNSON.
SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Mar. 4, 1899.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses.

Fig. 6.

Inventor.

J. T. Cross
J. Henderson



Eldridge R. Johnson.

by Homer Pelt,
Attorney.

No. 650,843.

Patented June 5, 1900.

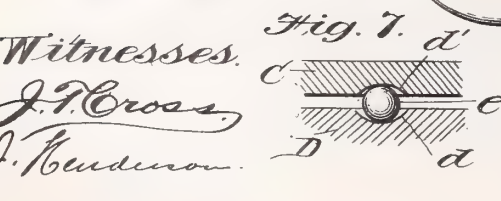
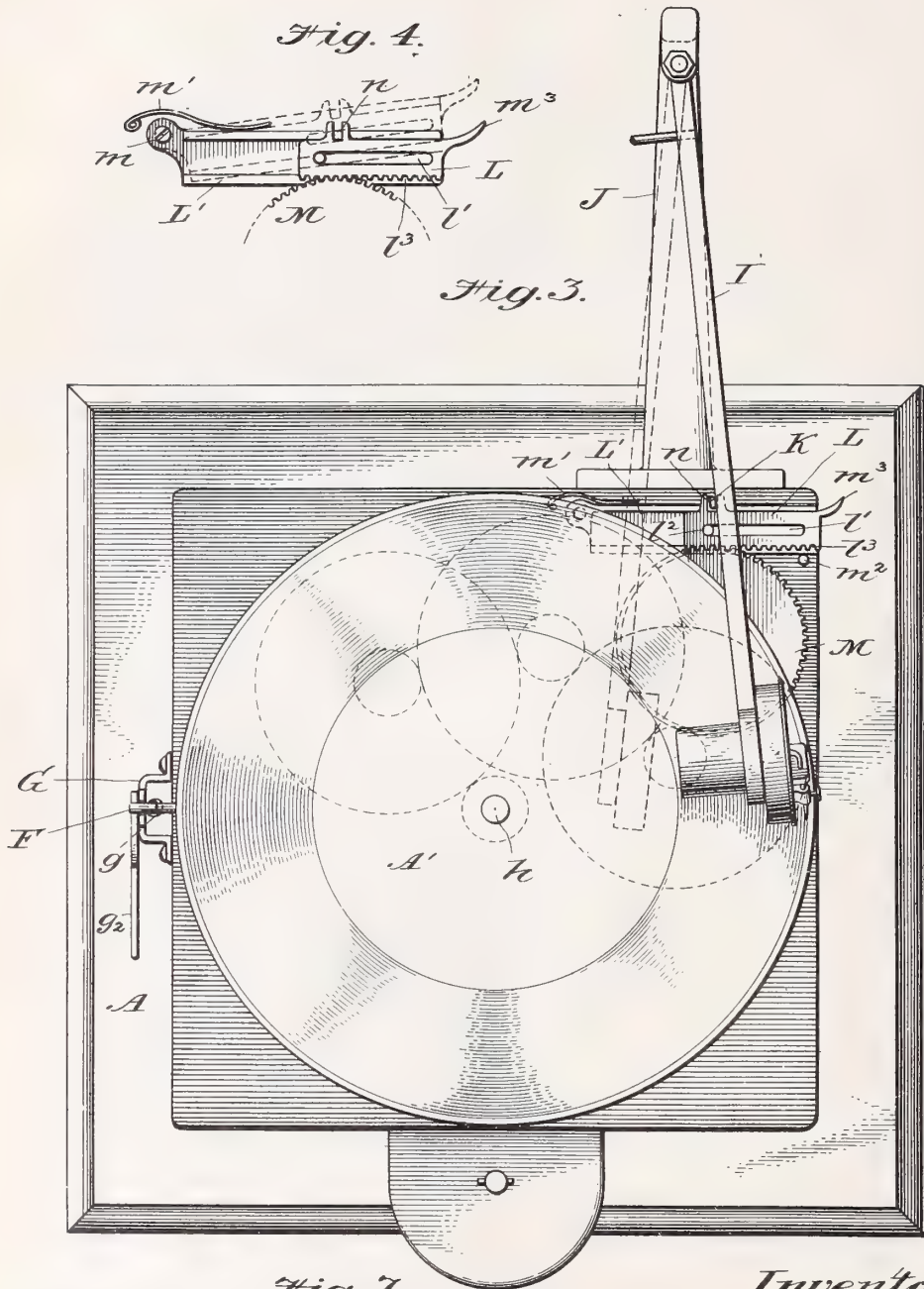
E. R. JOHNSON.

SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Mar. 4, 1899.)

(No Model.)

3 Sheets—Sheet 2.

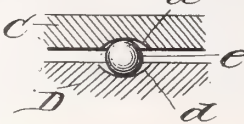


Witnesses.

J. F. Cross.

J. Henderson

Fig. 7.



Eldridge R. Johnson

by John Pelt,
Attorney.

Attorney.

E. R. JOHNSON.

SOUND RECORDING AND REPRODUCING MACHINE.

(Application filed Mar. 4, 1899.)

(No Model.)

3 Sheets—Sheet 3.

Fig. 5.

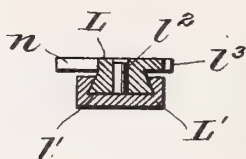


Fig. 8.

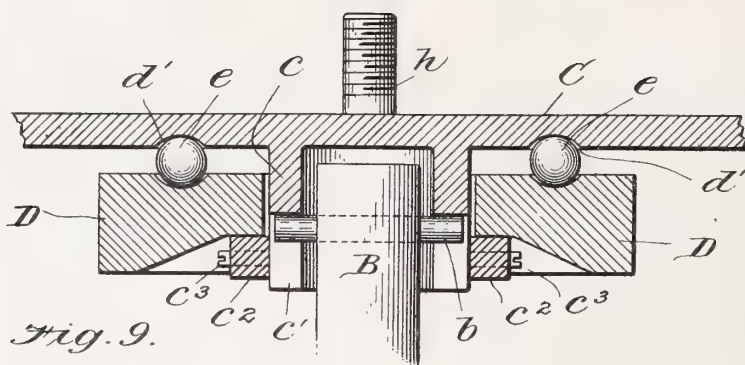


Fig. 9.

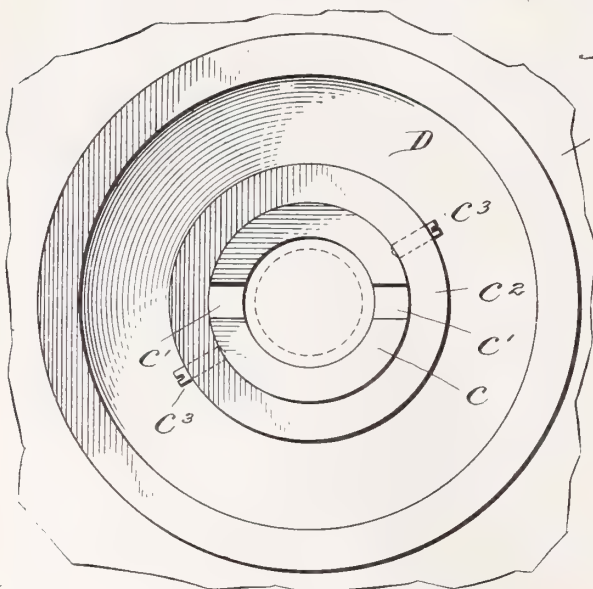
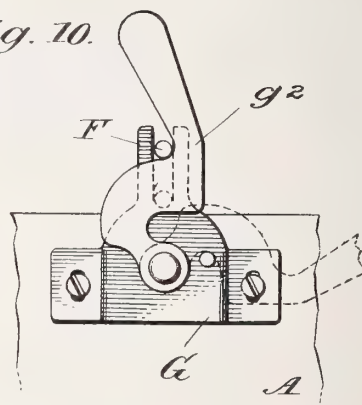


Fig. 10.



Witnesses.

John G. Cross,

J. Henderson.

Inventor,

Eldridge R. Johnson,

by Horace Pettit,
his Attorney.

his Attorney.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

SOUND RECORDING AND REPRODUCING MACHINE.

SPECIFICATION forming part of Letters Patent No. 650,843, dated June 5, 1900.

Application filed March 4, 1899. Serial No. 707,731. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Sound Recording and Reproducing Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

This invention has relation to certain improvements in sound recording and reproducing machines, and particularly to the class known as "gramophones," although it might be adapted to any other machines of similar character which employ a flat record-disk.

The main object of this invention is to provide a simple and effective means for supporting the record-disk and its carrying-table in such a manner that it is capable of a yielding movement at its point of contact with the stylus of a vertically-rigid reproducer; also, to provide means for rendering the said record capable of a slight lateral movement and a very slight yielding movement in any direction, so as to accommodate any irregularities or unevenness that might occur in the record-disk.

A further object of this invention is to provide an improved means connected with the driving mechanism of the motor for positively feeding the pivoted arm carrying the reproducing mechanism in a lateral direction, so that the stylus-point of said reproducing mechanism will follow or accommodate itself to the spirally-arranged record-groove of the record-disk.

With these objects in view my invention consists in the construction, combination, and arrangement of parts, such as will be hereinafter fully described, and pointed out in the claims made hereto.

In the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation showing the record-carrying table in central section and having my improved construction applied thereto. Fig. 2 is a plan view of Fig. 1, showing the central portion of the turn-table broken away and the hub or boss on the under side of the turn-table illustrated in cross-section. Fig. 3 is a plan view illustrating the pivoted arm which carries

the reproducer and the mechanism for feeding the same laterally, the gearing connected with the driving-shaft of the motor being illustrated in dotted lines. Fig. 4 is a detail view of the rack and its supporting-plate which feeds or imparts lateral movement to the reproducer-supporting arm. Fig. 5 is a detail cross-sectional view through the slide and rack illustrated in Fig. 4. Fig. 6 is a detail view illustrating the boss on the under side of the turn-table, showing the slot adapted to engage the pin on the driving-shaft. Fig. 7 is an enlarged detail section through the groove or raceway for the balls of the turntable. Fig. 8 is an enlarged detail section illustrating the disk supporting the ball-bearings of the turn-table and the means for adjusting same. Fig. 9 is a bottom plan view of the mechanism illustrated in Fig. 8. Fig. 10 is a side elevation of the cam mechanism used for tilting the record.

In the drawings I have illustrated an outer frame or casing A, adapted to inclose a spring-motor, such as is ordinarily used for propelling machines of this character, and in the center of which is the driven shaft or turntable spindle B, which projects a short distance above the top of the casing A, as illustrated in Fig. 1 of the drawings.

C designates the turn-table, which is of the usual form and has provided on its under side a central boss or hub *c*, the inner bore of which is of a diameter somewhat larger than the upper end of the driving-spindle B, over which it is adapted to fit loosely, so as to have play in any direction. A pin *b*, passed transversely through the spindle B, projecting a short distance on each side thereof, is adapted to enter the seats formed by the slots *c'*, provided in the boss *c* of the turntable, thus forming a support and coupling between the driving-spindle B and the said turn-table C. The slot *c'* above mentioned is formed slightly larger than the diameter of the pin *b*, so that the turn-table will rest loosely on said pin and have a slight play for the purpose hereinafter described.

D designates a disk provided with a central aperture which fits over the boss *c* of the turn-table and which is held on said boss by means of a ring or collar *c''*, which is fitted on the boss below the disk D. The under side

of the disk D is reamed out, as illustrated in Figs. 1, 8, and 9, so that the ring or collar c^2 can fit within said reamed-out portion for economy of space. The upper surface of the disk D has formed therein an annular groove d , which forms a raceway for a series of balls e . The lower surface of the turn-table is also provided with an annular groove d' , drawn from a radius the same as the annular groove d and in which the upper surface of the balls bear. There is a slight space between the upper surface of the disk D and the turn-table, and the ball-bearing between these two surfaces can be adjusted by means of the collar c^2 , which is adjustable on the boss c by means of suitable set-screws, as c^3 . If the ball-bearings e should be either too loose or too tight, the set-screws c^3 , which pass through the collar c^2 and secure the same on the boss c , can be loosened up and the said collar adjusted either up or down on the boss, which raises or lowers the disk D, and thereby adjusts the bearings. The grooves d and d' are of a slightly-larger diameter than that of the balls e , thus allowing of a slight lateral movement by the turn-table and its record, so that the said record may accommodate itself to the irregularities which occur in the side walls of the grooves of the record when the stylus-point is in engagement with said grooves.

On the top of the casing A is secured, by means of screws or otherwise, a half-ring casting E, having threaded apertures in its ends which are on a diametrical line with the center of the turn-table spindle B. Into these apertures are inserted the pivot-screws e' , which are provided with pointed ends adapted to enter countersunk openings in the sides of the disk D and form pivots upon which the said disk rocks. Lock-nuts e^2 are provided on the outer portions of the screws e' for locking the same after they are properly adjusted.

From the above description it will be readily understood that the turn-table C and its record A' are capable of a yielding or tilting movement at that point which is in contact with the stylus of the reproducer.

A radial rod F is secured at one end to the disk D, at right angles to the swinging axis of said disk, and extends out beyond the casing A, where it is supported and guided on a bracket G and has connected to it a coil-spring g , which tends to normally keep that end of it down and the opposite side of the record up or in constant contact with the stylus-point of the reproducer. A cam-lever g^2 is provided for throwing the rod F upward and tilting the turn-table and record so as to remove the record from contact with the stylus. The construction and operation of this part of my device are substantially the same as that described and illustrated in my application for Letters Patent filed January 3, 1899, Serial No. 701,083, and is not to be claimed in this application except in combination with the record-support.

The upper surface of the turn-table has formed in its center a screw-threaded nipple h , adapted to receive the lock-nut H, by means of which the record-tablet is securely held upon the turn-table.

I designate the reproducer-supporting arm, (illustrated in plan in Fig. 3 of the drawings,) which is pivoted at its outer end to a bracket J. The construction of this arm and bracket is substantially the same as that illustrated in my application before mentioned, (Serial No. 701,083,) and the operation is substantially the same, with the exception that I have added means for positively feeding the said arm in a lateral direction, so that the stylus-point carried thereby may be held in and made to follow the spiral groove of the record as the said record revolves. In order to accomplish this, I provide a depending arm K, secured to the arm I (see Fig. 3 of the drawings) and extending downwardly so as to engage a slotted lug n , formed on the rack-bar L. This rack-bar L is mounted in a guide-plate L', carried by the casing A of the machine, which is located near one corner of the said casing, as illustrated. On the under side of the rack-bar is formed a dovetail, adapted to fit and slide in a dovetail groove l , formed in the guide-plate L', and through the center of the said rack-bar is a longitudinal slot l' , through which passes the pin l^2 and by means of which the sliding movement of the rack is limited. On the projecting inner edge of the rack-bar L are the teeth l^3 , adapted to be engaged by the gear M, which is connected by suitable reducing-gearing (shown in dotted lines in Fig. 3) to the driving-shaft of the motor.

The guide-plate L' is pivoted at m to the casing A and is provided with a spring m' , which bears against its outer edge and keeps the rack-bar in engagement with the teeth of the gear M. A stop-pin m^2 is provided near the inner outer end of the guide-plate to limit its movement in that direction. A projection m^3 is formed on the outer end of the rack-bar L, by means of which it can be thrown out of engagement with the gear M, swinging on its pivot m' , the spring m^2 serving to return it to normal position as soon as the same is released by the operator. On the rear edge of the rack-bar L is formed a slotted or bifurcated projection n , in which the depending arm K rests, as before described.

From the above description it will be evident that as the driving-shaft B operates motion will be transmitted through the medium of the connecting-gearing to the rack-bar L, the said connecting-gears being so arranged as to greatly reduce the speed of the rack, so that it will travel in the correct proportion to feed the arm I and its carrying mechanism so that the stylus-point will follow the grooves of the record as the said record is revolved. When the end of the record-groove has been reached, the rack-bar L will have traveled the distance of the length of the slot l' , the pin l^2 serving as a stop and limiting the movement

of the said rack, which will stop the motor. The rack can then be disengaged from the gear M and the arm I returned back to its starting position.

5 On the casing A is a spring-arm *o*, having its upper free end bent so as to extend under the turn-table C, and in this free end is secured a teat *o'*, of leather or other suitable material, adapted to bear against the under
10 side of the turn-table when the same is tilted away from contact with the stylus-point by the cam-lever *g*² and rod F, as heretofore described, thus serving as a brake for stopping the machine.

15 The construction of the boss *c* and the manner in which it is mounted on the spindle B admit of the turn-table being tilted slightly in any direction, the play in the bore of the boss *c* and also the play in the slot *c'* allowing
20 it to be tilted or to yield slightly in any direction, as hereinbefore stated.

The sound-box and trumpet I have not considered necessary to describe or illustrate in detail, as they form no part of my invention
25 and could be of any of the well-known constructions.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

30 1. In a sound recording and reproducing machine, the combination with the casing of a driving-spindle, a record-support loosely mounted thereon so as to revolve therewith, a disk pivotally mounted on the casing of the
35 machine, means for securing the said disk to the record-support, and ball-bearings located between the said disk and the record-support, substantially as described.

2. In a sound recording and reproducing
40 machine, the combination of a driving-spindle, a turn-table loosely mounted thereon so as to revolve therewith, a stationary pivoted bearing-block in which the turn-table is loosely mounted, ball-bearings between the
45 upper face of the bearing-block and the bottom of the turn-table, and means for adjusting the said ball-bearings, substantially as described.

3. In a sound recording and reproducing
50 machine, the combination of a driving-spindle, a turn-table adapted to support the record mounted to revolve with driving-spindle, a stationary bearing-block pivotally
55 mounted to the casing of the machine and in which the turn-table is journaled, ball-bearings on the upper surface of the bearing-block and the bottom of the turn-table, and means for tilting the said bearing-block and holding it in its tilted position, substantially as described and for the purpose stated.

4. In a sound recording and reproducing machine, the combination with the driving-shaft, a turn-table having a depending boss adapted to fit over the end of the driving-shaft, the aperture of said boss being of larger
65 diameter than the driving-shaft, slots located in the sides of the boss, a transverse pin se-

cured to said shaft adapted to rest in the said slots and partly support the turn-table, a bearing-plate pivotally mounted on the frame
70 of the machine, a central opening in said bearing-plate into which the boss loosely fits, ball-bearings between the bearing-surface of the bearing-block and the turn-table and means for holding the said boss in the bearing-block,
75 substantially as described.

5. The combination of the revolving turn-table spindle, a turn-table loosely mounted on said spindle and adapted to revolve therewith, a bearing-block secured to the frame of
80 the machine on a pivotal axis having a central aperture adapted to receive the depending boss of the turn-table, annular grooves formed on the upper surface of the bearing-block and the lower surface of the turn-table
85 forming a raceway, and a series of balls adapted to said raceway, substantially as described.

6. The combination of the revolving turn-table spindle, a turn-table provided with a boss having an opening of larger diameter than
90 the spindle adapted to fit over the end of said spindle, a pin passing through the spindle and engaging slots in the turn-table boss, a bearing-block secured to the frame of the machine on a pivoted axis, a central aperture for said
95 block into which the boss is loosely fitted, annular grooves formed on the upper surface of the block and the lower surface of the turn-table, said grooves being of a larger diameter than the balls, and a series of balls adapted
100 to said grooves, substantially as described and for the purpose stated.

7. The combination of a revoluble turn-table spindle, of a turn-table having a boss,
105 *c*, formed thereon adapted to loosely fit over the end of the spindle, slots, *c'*, formed in said boss, a transverse pin, *b*, carried by the revolving spindle adapted to fit loosely in the slots, *c'*, a bearing-block, D, mounted in piv-
110 otal bearings, *e'*, secured on the frame of the machine, grooves, *d*, provided in the bearing-surface of the block, D, and grooves, *d'*, provided on the bearing-surface of the turn-table, balls *e*, adapted to said grooves, and a collar, *c*², adjustably secured on the boss, *c*, substantially as described.

8. In a sound recording and reproducing machine, the combination with a yielding-
120 mounted record-disk, of a laterally-movable support carrying the reproducer, a movable rack supported on the frame of the machine, a connection between the said rack and the reproducer-support, and a system of gearing connecting the said rack with the driving
125 mechanism of the motor, for laterally feeding the reproducer so that its stylus-point will positively follow the grooves of the record, substantially as described.

9. In a sound recording and reproducing machine, the combination of a yielding-
130 mounted record-disk, a laterally-movable reproducer, a pivoted supporting-arm for said reproducer, a rack-bar adapted to slide in a guide-plate, a rigid connection between the

supporting-arm and the rack-bar, gearing connecting the rack-bar with the driving-shaft of the motor, and means for disengaging the said rack from its connecting gearing, substantially as described.

10. In a sound recording and reproducing machine, a yieldingly-mounted record-disk, a laterally-swinging reproducer, a pivoted supporting-arm for said reproducer, a rack-
 15 bar adapted to slide in a guide-plate, said guide-plate being pivoted at one end to the frame of the machine, a connection between the reproducer-support and the rack-bar, gearing connecting the said rack with the
 15 driving mechanism of the machine, and a spring for keeping the said rack in engagement with its intermeshing gear, substantially as described.

11. The combination of the yieldingly-
 20 mounted record, a laterally-movable reproducer, a pivoted supporting-arm for said reproducer, a rack-bar adapted to slide in the direction of the movable arm, a guide-plate pivoted at one end to the casing of the ma-
 25 chine in which the rack-bar slides, means limiting the movement of the said rack, a

gear supported on the casing adapted to mesh with the rack-bar, and a system of reducing-gear connecting the above-mentioned gear with the driving mechanism of the motor, 30 substantially as described.

12. The combination of a yieldingly-supported record-disk, a laterally-movable reproducer, a pivoted supporting-arm, for said reproducer, a plate, L' , pivoted at one end to 35 the casing of the machine, a groove, l , provided in said plate adapted to receive a rack-bar, L , a slot, l' , located in said rack-bar, a pin, l^2 , carried by the plate, L' , adapted to said slot, a bifurcated projection, n , located 40 on the smooth edge of the rack, a depending arm connected to the arm, I , engaging the bifurcation of the projection, n , and gearing connecting the rack, L , with the driving-shaft of the motor, substantially as described. 45

In witness whereof I have hereunto set my hand this 25th day of February, A. D. 1899.

ELDRIDGE R. JOHNSON.

Witnesses:

L. S. BOWERS,
 J. T. CROSS.

No. 651,076.

Patented June 5, 1900.

E. R. JOHNSON.
GRAMOPHONE.

(Application filed Feb. 3, 1898.)

(No Model.)

2 Sheets—Sheet 1.

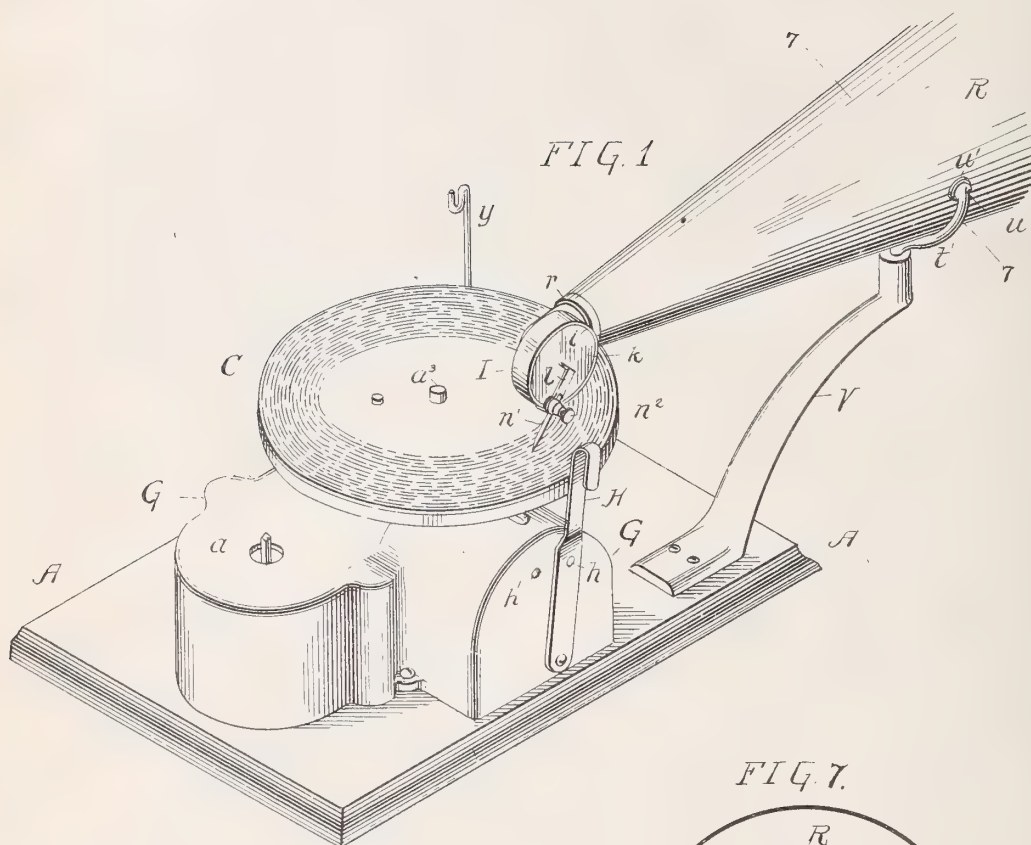
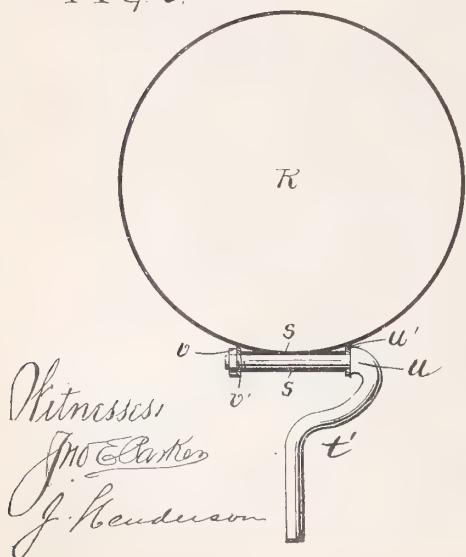
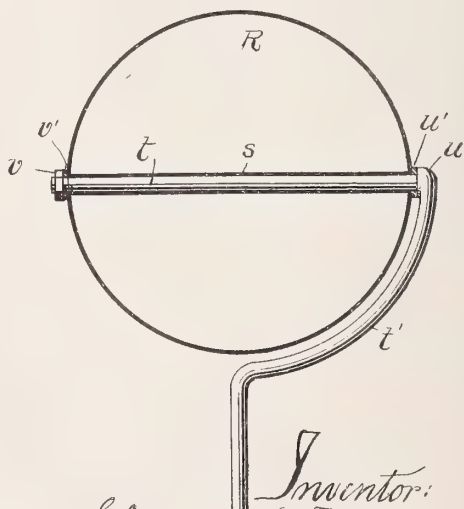


FIG. 8.



Witnesses:
J. M. Clarke
J. Henderson

FIG. 7.



Inventor:
Eldridge R. Johnson
by his Attorneys,
Stone & Pettit

No. 651,076.

Patented June 5, 1900.

E. R. JOHNSON.
GRAMOPHONE.

(Application filed Feb. 3, 1898.)

(No Model.)

2 Sheets—Sheet 2.

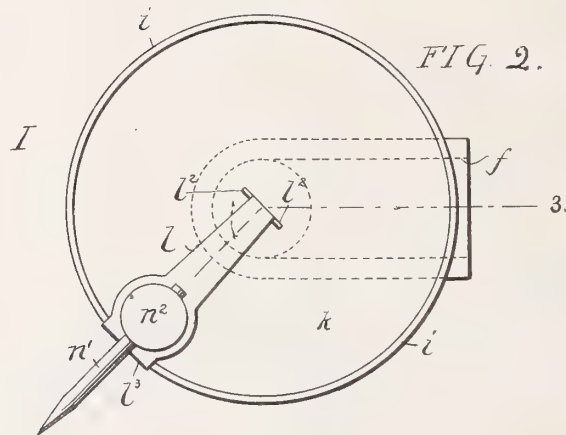


FIG. 2.

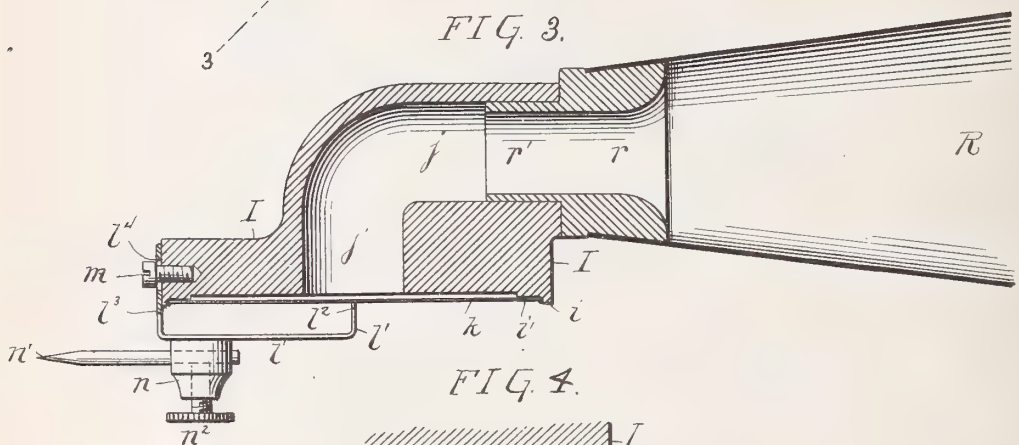


FIG. 3.

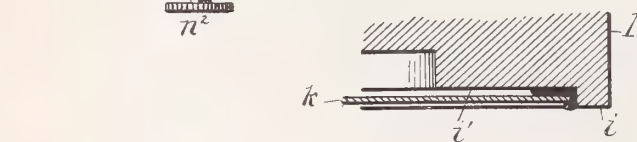


FIG. 4.

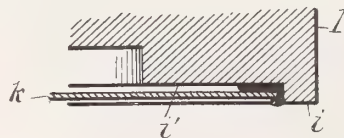
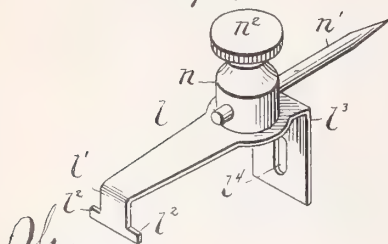
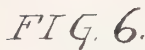


FIG. 5.



Witnesses:
Geo E Parker
 J. Henderson

Inventor:
Eldridge R. Johnson.
by his Attorney,
James Pettit.

UNITED STATES PATENT OFFICE.

ELDRIDGE R. JOHNSON, OF PHILADELPHIA, PENNSYLVANIA.

GRAMOPHONE.

SPECIFICATION forming part of Letters Patent No. 651,076, dated June 5, 1900.

Application filed February 3, 1898. Serial No. 668,938. (No model.)

To all whom it may concern:

Be it known that I, ELDRIDGE R. JOHNSON, a citizen of the United States, and a resident of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Gramophones, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification:

My invention relates to certain improvements in sound recording and reproducing machines.

One object of the invention is to provide an improved form of sound-box and stylus-carrying bar and to provide for the accurate and delicate adjustment of the stylus-bar with respect to the diaphragm.

A further object of the invention is to provide an improved form of support for the trumpet and to simplify the construction of the same and the connection between the trumpet and the sound-box.

Further objects of the invention are generally to simplify, cheapen, and improve the appearance of the machine, as more fully set forth hereinafter.

In the accompanying drawings, Figure 1 is a perspective view of a sound recording and reproducing machine constructed in accordance with my invention. Fig. 2 is a front elevation of the sound-box. Fig. 3 is a sectional plan view of the same on the line 3 3, Fig. 2. Fig. 4 is a view illustrating a portion of the sound-box drawn to an exaggerated scale. Fig. 5 is a detached perspective view of the rear face of the sound-box. Fig. 6 is a detached perspective view of the stylus and its support. Fig. 7 is a transverse sectional view, on an enlarged scale, on the line 7 7, Fig. 1. Fig. 8 is a similar view illustrating a modification of the structure shown in Fig. 7.

Referring now to the drawings, I represent the sound-box, formed of a single piece of cast metal. The front face of the box is circular in form, and around its outer edge is formed a circular flange *l*, and within the flange is a seat *l'* for the reception of the diaphragm. The rear portion of the box is enlarged to form a channel *l*, connecting with the central opening *l'* at the front face of

the box, but at a right angle thereto, so that the trumpet may be conveniently attached to the box without the expense of auxiliary elbows or joints such as are ordinarily employed.

The diaphragm *k* is formed of a disk of thin sheet metal or other suitable material and is confined in place by a wax or gum of slightly-elastic nature, which will permit of the vibrations of the diaphragm in response to the undulatory movement of the stylus. In fastening the diaphragm in place the sound-box is heated and a quantity of wax is placed all around the seat *l'*. The diaphragm, which is just a trifle less in diameter than the diameter of the recess which it is to occupy, is then carefully pressed down upon the wax, causing some portion of the wax to exude between the periphery of the diaphragm and the inner wall of the flange *l*, as more clearly shown in the exaggerated view.

The stylus-support is in the form of a thin sheet of resilient metal stamped and bent to form a strip *l*, having its two ends bent at right angles to the main body of the strip. The end *l'*, as shown more clearly in Fig. 6, is provided with two outwardly-extending nibs or feet *l''*, which rest against the center of the diaphragm and serve to insure a close joint between the diaphragm and the end of the strip, a wax of slightly-elastic nature being employed to bind the two together and extending partly over these two nibs or feet *l''*. The opposite end *l''* of the supporting-strip is adapted to a small recess formed in the periphery of the sound-box and is provided with an elongated slot *l'''*, through which passes a securing-screw *m*, the slot permitting of the adjustment of the strip to any desired position and insuring the proper contact between the end *l'* of the strip and the diaphragm *k*. On the strip *l* is secured a boss *n*, having a transversely-disposed opening for the reception of the stylus *n'*, of the usual character, the stylus being held in proper position by a set-screw *n''*.

In the recording or reproducing of sound-waves the stylus supporting strip *l* is so adjusted that the end *l'* of the strip will be in perfect contact with the diaphragm, and as the latter is moved under the impulse of sound-waves or as the stylus is moved in the

reproduction of recorded sound-waves the strip will bend to and fro at the juncture of the portions l^3 of the strip or at a point between there and the edge of the flange i .

5 The trumpet R is provided at its smaller end with an annular ring r , from which projects a small circular flange r' , adapted to enter the opening j in the sound-box, and thus serving as a means of firmly connecting
10 the trumpet to the sound-box. About midway between the ends of the trumpet the latter is provided with a diametral tube s , through which extends a rod t , secured to or forming part of a supporting-bar t' , the lower
15 end of which is adapted to a recess or orifice in a bracket V, projecting from the base A. The upper portion of the bar t' is curved to conform to the contour of the trumpet and at its juncture with the rod t is provided
20 with a shoulder u , between which and the face of the trumpet is placed a washer u' , of rubber or other yielding material. At the opposite end of the rod t is a nut v , and between this and the face of the trumpet is a
25 similar washer v' . By supporting the trumpet in this manner the usual brackets are avoided and the appearance of the instrument materially improved.

In the modified structure shown in Fig. 8
30 the tube s is soldered or otherwise secured to the bottom of the trumpet; but otherwise the connection with the supporting-post t' is the same as that described with reference to Fig. 7.

35 When the instrument is not in use or the record-disks are being changed, the sound-box and trumpet are turned, with the supporting-post t' as a pivot, until they rest upon a support y , formed of a strip of wire having
40 its upper end bent to conform to the contour of the sound-box.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

45 1. The combination of the sound-box, I, having a circular flange, i , and a diaphragm-seat, i' , of the diaphragm, k , of a diameter less than the diameter of the inner wall of the flange, i , and a quantity of wax between
50 the periphery of the diaphragm and its seat for holding the same to the sound-box, substantially as specified.

2. The combination of the sound-box, I, having an annular recess, i , for the reception
55 of the diaphragm, a diaphragm, k , of a diameter less than the inner wall of the recess, and an adhesive plastic material inserted in the shoulder formed by the recess, i , extending between the periphery of the diaphragm and
60 the inner wall of the recess and slightly overlapping the front edge of said diaphragm for securing the same in position, substantially as described.

3. The combination of the sound-box, I,
65 having an annular recess, i , for the reception of a diaphragm, a diaphragm, k , of a diame-

ter less than the inner wall of the recess, a wax or other elastic cement inserted back of the diaphragm around the periphery thereof, and extending between the edge of said diaphragm and the inner wall of the recess and slightly overlap the front face of the diaphragm, substantially as shown and described. 70

4. The combination of the sound-box, a diaphragm secured thereto, a stylus, a stylus-supporting bar comprising a thin resilient strip of metal having one end bent at an angle for contact with the diaphragm and its other end bent and connected to the periphery
80 of the sound-box, and means for adjusting this end of the strip for insuring the proper contact of the opposite end of the strip with the diaphragm, substantially as described.

5. The combination of the sound-box, a diaphragm secured thereto, a stylus, and a stylus-supporting strip, l , having one of its ends bent at a right angle to the length of the strip and provided with projecting nibs or feet, l^2 ,
85 for contact with the diaphragm, substantially as specified. 90

6. A stylus-support comprising a strip of thin sheet metal having its opposite ends bent at a right angle to the length of the strip, one of such ends being provided with an elongated slot for connection with a support and the opposite end having projecting nibs or feet for contact with a diaphragm, substantially as specified. 95

7. The combination with the sound-box and diaphragm of the stylus-support, l , having its opposite ends bent at right angles to the length of the support and connected respectively to the diaphragm and to the sound-box, a boss, n , secured to the support and recessed
105 for the reception of a stylus, and a set screw, n^2 , for holding the stylus in position, substantially as specified.

8. The combination with the sound-box, of a trumpet secured thereto, a transversely-arranged tube secured to said trumpet, a supporting-bar having its upper end bent and extending through said tube, and means for securing the upper end of the supporting-bar in the transverse tube, substantially as described. 115

9. The combination of the trumpet, a transverse tube, s , secured to or formed integral therewith, a supporting-bar, t' , having a rod, t , secured to or formed integral therewith and
120 extending through said tube, a nut, v , on the outer threaded end of said rod and washers of yielding material arranged in contact with the opposite sides of the trumpet, substantially as specified. 125

In witness whereof I have hereunto set my hand this 2d day of February, A. D. 1898.

ELDRIDGE R. JOHNSON.

Witnesses:

FRANK D. GRAHAM,
HORACE PETTIT.

No. 651,308.

Patented June 5, 1900.

W. HART.
GRAPHOPHONE SOUND BOX.

(Application filed July 22, 1899.)

(No Model.)

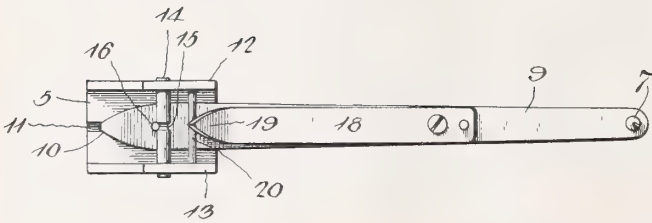
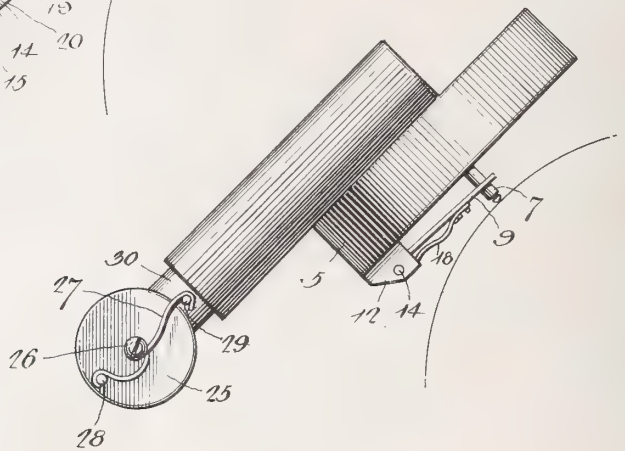
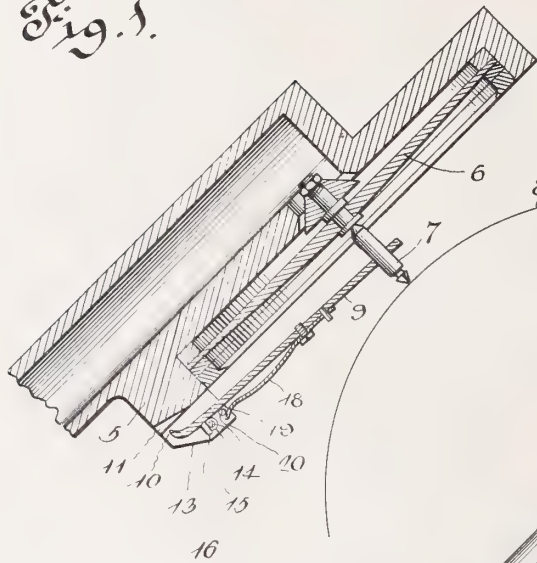


Fig. 2.

Witnesses
Frank Culverwell.
Geo. H. Chandler.

William Hart, Inventor.
By his Attorneys.

Calhoun & Co.

UNITED STATES PATENT OFFICE.

WILLIAM HART, OF KIRKSVILLE, MISSOURI.

GRAPHOPHONE SOUND-BOX.

SPECIFICATION forming part of Letters Patent No. 651,308, dated June 5, 1900.

Application filed July 22, 1899. Serial No. 724,823. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM HART, a citizen of the United States, residing at Kirksville, in the county of Adair and State of Missouri, have invented a new and useful Graphophone-Reproducer, of which the following is a specification.

This invention relates to graphophones, and more particularly to the reproducers thereof; and it has for one object to provide a stylus-carrying arm which has such a connection with the diaphragm-supporting frame as will permit of universal movement of the stylus to enable it to be accurately seated upon the record, a further object of the invention being to provide a construction which in conforming with delicacy to the undulations of the record will intensify the volume and distinctness of the sound.

In the drawings forming a portion of this specification, and in which similar numerals of reference designate corresponding parts in the several views, Figure 1 is a longitudinal section of portions of a reproducer and of the stylus-arm, showing the location and arrangement of the latter, the stylus and adjacent portions being in elevation. Fig. 2 is a bottom plan view of the stylus-arm, showing its connection with the bracket through the medium of which it is attached to the frame. Fig. 3 is a side elevation showing the pivotal connection of the tubular frame-carrying arm.

Referring now to the drawings, 5 represents a sound-box, of usual construction, and in which is mounted a diaphragm 6, adapted to operate in connection with a stylus 7, which transmits vibrations thereto, to reproduce sounds recorded upon a record 8, having the usual mechanism for rotating. The stylus 7 is movably supported centrally of the diaphragm 6 through the medium of an arm 9. The outer end of the arm 9 is curved in the direction of the frame 5 and is tapered to a point, as shown at 10, to enter a recess or slot 11 in the frame 5, and which slot is disposed in radial alinement with the diaphragm. The slot 11 is curvilinear in cross-section, thus to permit the displacement of the end of the arm 9 therefrom under excessive lateral pressure, also to permit the ready seating of the end of the arm 9 in radial alinement with the dia-

phragm to bring the stylus 7 into axial alinement with the diaphragm and ready for engagement with the record.

Fixed to or formed integral with the frame 5 are parallel ears 12 and 13, connecting which is a pin 14, having a peripheral groove 15, preferably semicircular in cross-section, and in which lies the pin 16, which is fixed to the arm 9 adjacent to its outer tapered end. Thus if the pin 16 be held in engagement with the peripheral groove 15 the arm 9 may be moved, with the stylus 7, in the direction of the diaphragm 6 to lift the tapered end 10 from the groove 11, and when the tapered end is thus lifted the arm 9 may have a lateral swinging motion, and, furthermore, the inner end of the arm, and therewith the stylus, may be moved in a circular orbit.

In order to hold the pin 16 in engagement with the groove 15, a spring-plate 18 is fixed to the arm 9 and has its outer end curved inwardly and then outwardly to form a shoulder 19, which lies against and exerts pressure upon a second pin 20, connected with the ears 12 and 13. The shoulder 19 is in slidable contact with the pin 20, and as the arm 9 is rocked from side to side the spring 18, including the shoulder, has a yielding motion and tends to return the arm to the position shown in Fig. 2. Thus it will be seen that when the reproducer is out of engagement with the record the stylus may be accurately alined with the axis of the diaphragm and that it may be engaged while in this condition with the record, also that as soon as the stylus engages the record in its tendency to support the weight of the reproducer the stylus, together with the arm, will be moved in the direction of the diaphragm 6, the parts of the apparatus being so proportioned that when the stylus has engaged the diaphragm the tapered end 10 of the stylus-arm will be raised from the groove 11, and thus the stylus may have a movement longitudinally of the record in addition to and independent of that movement contributed by the feed mechanism of the reproducer. Hence the stylus may readily adapt itself to all variations in location of the impression upon the record longitudinally of the latter, and the result will be an accurate reproduction. Also the tendency of the

spring 18 to move the end 10 of the stylus-arm in the direction of the slot or groove 11 exerts a yieldable pressure of the stylus upon the record, and thus eliminates the noises and other objectionable results incident to the failure of the stylus to accurately follow the undulations of the record.

It will of course be understood that in practice the ears 12 and 13 may be formed upon a bracket, which is fixed to the frame of the reproducer, or that the ears may be formed integral with the frame, and that the specific construction shown and described may be otherwise varied without departing from the spirit of the invention.

In Fig. 3 of the drawings there is shown the means for holding the sound-box yieldably in a position to maintain engagement of the stylus with the record to assist the action of gravity. In this figure of the drawings, 25 represents the fixed cylindrical element of the usual pivotal connection, through which and the adjacent end of the sound-box-carrying arm there is passed a pivot screw or bolt 2. A spring-wire 27 has a hook at one end, engaging a projection 28 upon the face of the fixed element, from which pin the wire is looped around the adjacent end of the pivot-bolt, and has a hook upon its opposite end engaging the pin 29 upon the box-carrying arm 30. A similar arrangement is provided at the opposite side of the connection, the tension of the spring being such as to tend to rotate the arm upon its pivot, and thus hold the diaphragm adjacent the record and maintain yieldable engagement of the stylus with the record.

While in the drawings there is shown a spring-wire, it will of course be understood that any other specific form and arrangement of spring for the purpose may be employed.

Having thus described the invention, what is claimed is—

1. In a graphophone-reproducer, the combination with a sound-box and a diaphragm, of ears carried by the frame, a groove intermediate the ears, a stylus-carrying arm adapted to enter said groove to aline with a radius of the diaphragm, a pin carried by the arm, a pin supported by the ears and having a peripheral groove adapted to receive the pin in

the arm, and means for yieldably holding said pin in the groove.

2. In a graphophone-reproducer, the combination with a sound-box and a diaphragm, of ears carried by the frame, a groove intermediate the ears, a stylus-carrying arm adapted to lie in said groove and to be held thereby in a predetermined position, a pin carried by the ears and having a peripheral groove, a pin carried by the arm and adapted to rockingly engage said groove and to move therein peripherally of the pin in the ears, a second pin connected with the ears, and a spring carried by the arm and engaging the last-named pin to hold the pin and groove in mutual engagement.

3. In a graphophone, the combination with a record and a reproducer comprising a diaphragm, a sound-box including a sound-tube, and a stylus in operative relation to the diaphragm, of a support for the box having pivotal connection with the sound-tube thereof, a pin carried by the sound-tube, a pin carried by the support, and a spring engaging the said pins and having a loop encircling the pivotal connection, said wire being adapted to hold the box yieldably in the direction of the record.

4. In a graphophone, the combination with a sound-box having a diaphragm, of a stylus-carrying arm having universal connection with the box and adapted to hold the stylus in engagement with the record, a projection upon the arm, and a groove in the box adapted to receive the projection and hold the arm against universal movement when the stylus is disengaged from the record.

5. The combination with a sound-box having a diaphragm, of a stylus-carrying arm having a universal connection with a sound-box, and means for holding the arm yieldably against universal movement when its stylus is disengaged from the record.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM HART.

Witnesses:

JOHN M. DAVIS,
N. ANSPAUCH.

No. 651,402.

Patented June 12, 1900.

F. W. WEAVER.
HORN FOR PHONOGRAPHS.

(Application filed Aug. 18, 1899.)

(No Model.)

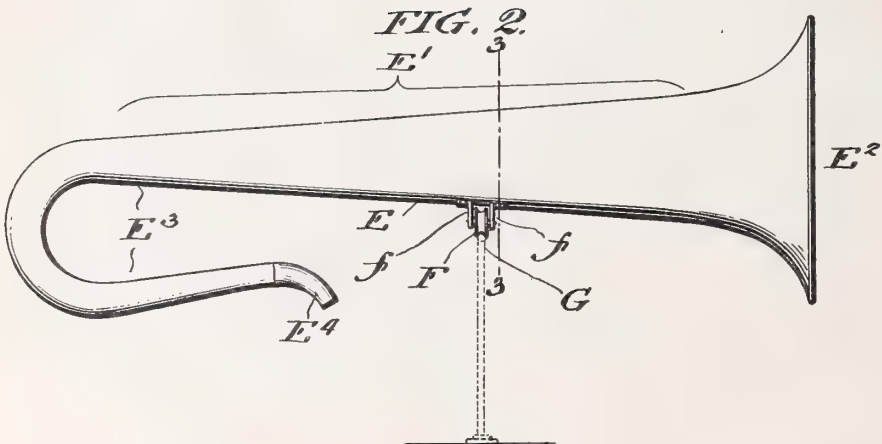
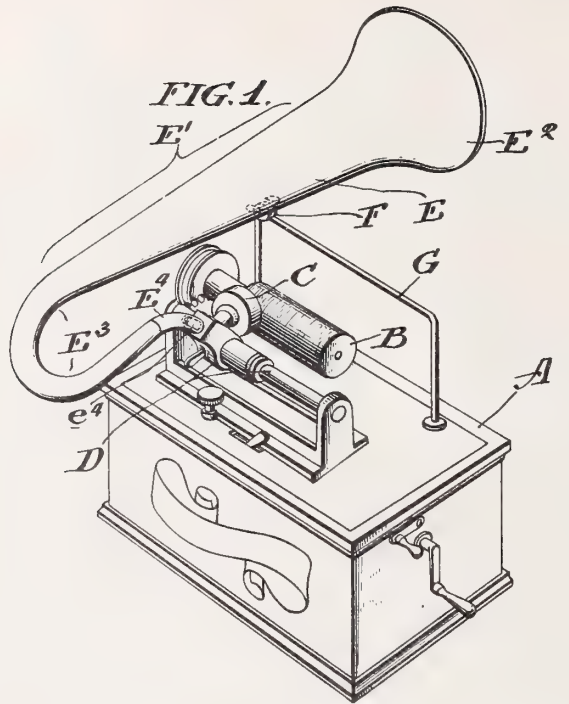
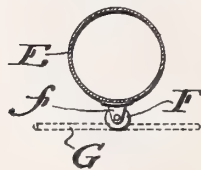


FIG. 3.

WITNESSES:

Wm. C. Cassner
Jesse B. Heller



INVENTOR

Floyd W. Weaver

-by-

David S. Williams
Att'y.

UNITED STATES PATENT OFFICE.

FLOYD W. WEAVER, OF PHILADELPHIA, PENNSYLVANIA.

HORN FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 651,402, dated June 12, 1900.

Application filed August 18, 1899. Serial No. 727,642. (No model.)

To all whom it may concern:

Be it known that I, FLOYD W. WEAVER, a citizen of the United States of America, and a resident of Philadelphia, in the county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Sound-Amplifying Horns for Sound-Reproducing Machines, of which the following is a specification.

My invention relates to new and useful improvements in sound-amplifying horns for graphophones or sound-reproducing machines; and it consists in a particular construction and arrangement of the horn and in means for supporting and guiding the same, as will be hereinafter more particularly set out.

Referring to the accompanying drawings, Figure 1 represents a perspective view of a sound-reproducing machine having an amplifying-horn constructed and arranged in accordance with my invention. Fig. 2 illustrates a detached side elevation of the horn, and Fig. 3 shows a cross-section on the line 3 3 of Fig. 2.

Referring to the reference-letters of the drawings, A represents the body of an ordinary sound recording and reproducing instrument.

B is the rotatable record; C, the sound-box; D, the mechanism for feeding the sound-box, and E is the sound-amplifying horn. The horn E is designed with a view to producing great clearness and strength of tone, and hence is connected directly to the sound-box, thus eliminating the use of flexible joints or rubber connections which have a tendency to cause much trouble and annoyance as well as mar the character of tone of the instrument.

In carrying out my invention I form the horn in the shape of a long tapered cylinder or cone E^1 , a bell E^2 , and a looped portion E^3 , which latter is provided with a metallic coupling E^4 , adapted to engage a stem e^4 , projecting from the sound-box of the sound-reproducing machine. By making the horn of this shape it is capable of giving a greater volume of tone, is rendered more compact, and is entirely out of the way of the person operating the machine, and as the horn is coupled directly to the machine by a metallic coupling

a much stronger reproduction of the record is obtained.

At or near the center of gravity of the horn is mounted a grooved roller F, supported in the bearings f, which are secured to the horn. Directly below the roller and supported from the bed-plate of the sound-reproducing machine is a track G, which receives nearly if not quite the entire weight of the horn and forms a smooth bearing and guiding surface for the same as the horn is carried backward and forward by the feeding mechanism of the sound-reproducing machine.

It will be understood that I do not limit myself to the exact construction shown and described in this specification, except where the same is specifically pointed out in the claims, as other modifications of my invention may be made without departing from the scope thereof.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A sound-amplifying horn comprising a conical body portion having a flaring portion or bell at one end, and a loop formed at the opposite end, and a roller mounted upon said horn adapted to support and guide the same.

2. A sound-amplifying horn comprising a conical body portion provided at one end with a loop-shaped portion of gradually-decreasing diameter, and at the opposite end with an extended opening or bell and means as a roller secured to the horn for supporting and carrying the same substantially as specified.

3. A sound-amplifying horn comprising a conical body terminating at one end in a loop and at the other end an extended opening or bell, a downwardly-curved coupling at the terminus of the looped portion and a supporting-roller secured to the body portion of the horn.

4. In combination with a sound-reproducing machine, a track mounted thereon, a horn arranged above the machine, and a roller on the horn adapted to said track.

5. In combination with a sound-reproducing machine or graphophone, a rail or track mounted thereon, a horn arranged above the machine, having at one end an extended opening or bell and at the opposite end a

gradually-decreasing portion in the form of a loop, the terminus of which is downwardly curved and adapted to engage the sound-box of the machine, and a roller mounted on the
5 horn about midway between its ends and adapted to the rail or track substantially as specified.

Signed by me at Philadelphia, Pennsylvania, this 16th day of August, 1899.

FLOYD W. WEAVER.

Witnesses:

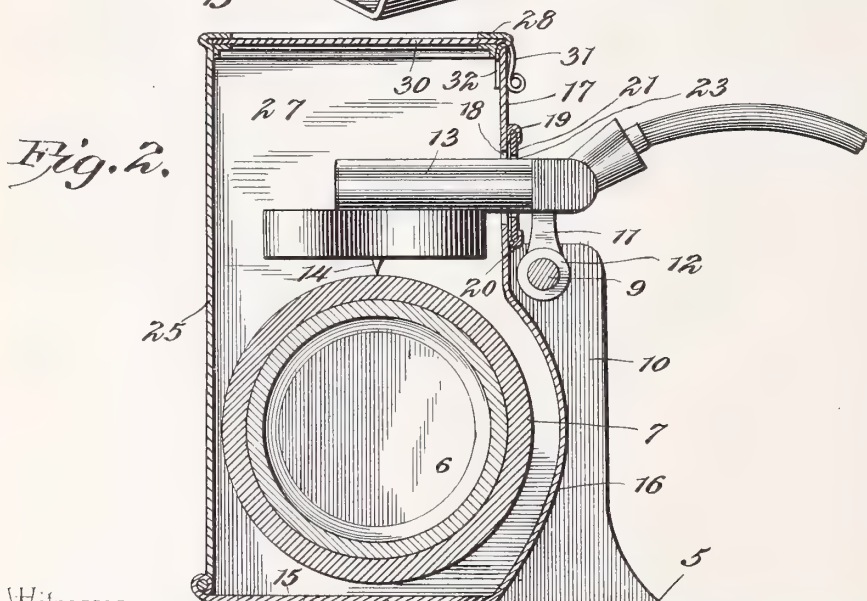
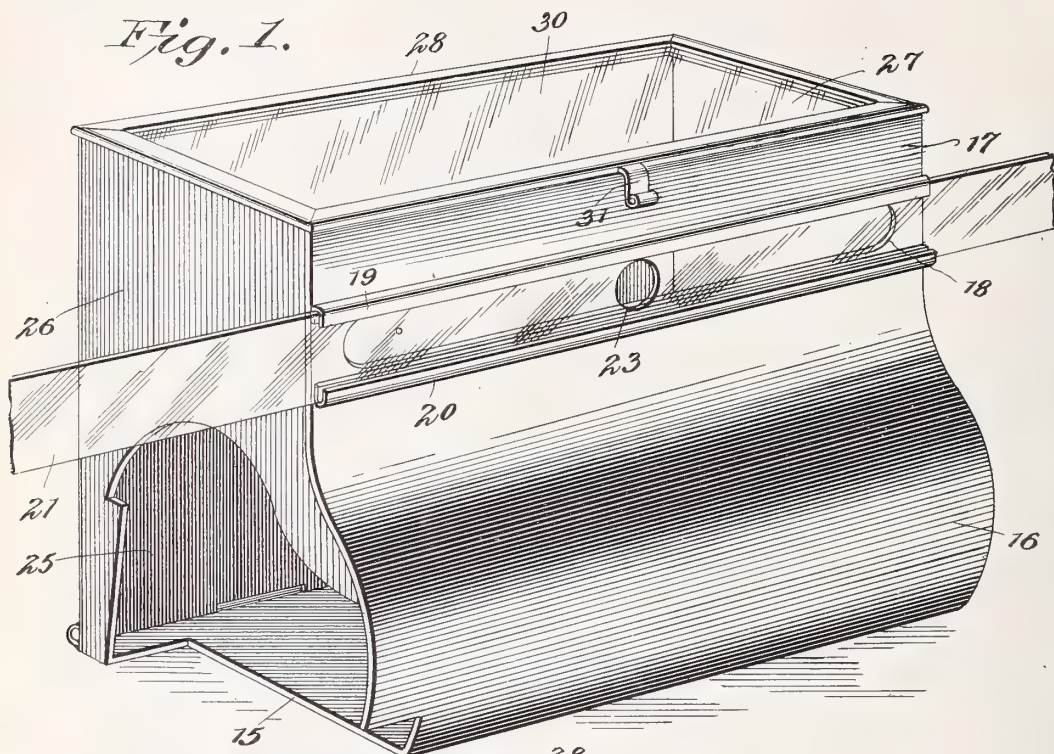
WALTER C. PUSEY,
DAVID S. WILLIAMS.

W. T. SHIELDS.
CASING FOR GRAPHOPHONES.

(Application filed Mar. 22, 1900.)

(No Model.)

2 Sheets--Sheet 1.



Witnesses

Howard D. Orr.

G. W. N. Chandler

By *this* Attorneys,

Inventor.

William T. Shields.

Cashnow & Co.

No. 651,515.

Patented June 12, 1900.

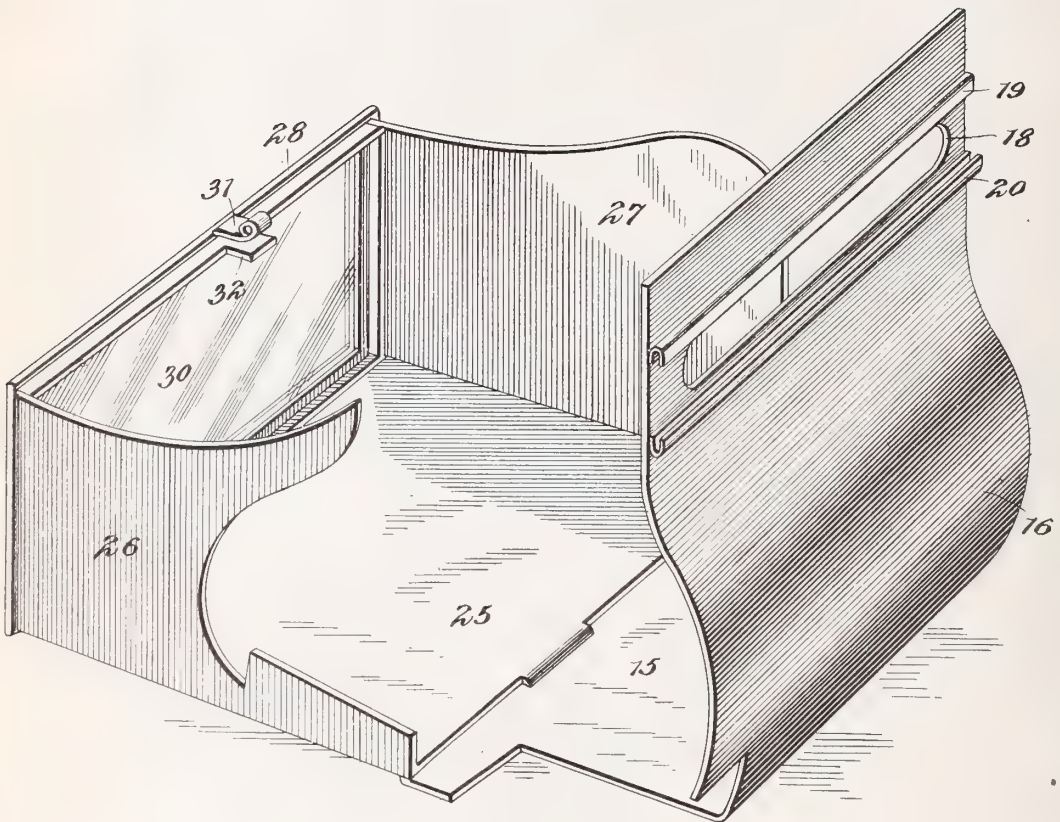
W. T. SHIELDS.
CASING FOR GRAPHOPHONES.

(Application filed Mar. 22, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.



Witnesses

Howard W. Carr

By *his* Attorneys,

Geo. H. Chandler

William T. Shields, Inventor,

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

WILLIAM T. SHIELDS, OF ALTOONA, PENNSYLVANIA.

CASING FOR GRAPHOPHONES.

SPECIFICATION forming part of Letters Patent No. 651,515, dated June 12, 1900.

Application filed March 22, 1900. Serial No. 9,769. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM T. SHIELDS, a citizen of the United States, residing at Altoona, in the county of Blair and State of Pennsylvania, have invented a new and useful Casing for Graphophones, of which the following is a specification.

This invention relates to graphophones in general, and more particularly to the reproducing portions thereof; and it has for its object to provide a protecting-casing for the record and reproducer which will entirely exclude exterior noises and will thus prevent air vibrations due to exterior causes from acting against the diaphragm of the reproducer, and thus modifying the sounds which emanate from the reproducer. It has been found that the squeaking and whistling noises that are given forth by the reproducer are due to exterior causes, such as the vibrations set up by the feeding mechanism and other parts of the phonograph or graphophone, and that these vibrations can be overcome by incasing the record and reproducer.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a perspective view showing the casing and the slide therein, which is employed where the records are weak. Fig. 2 is a transverse section taken through a graphophone equipped with a casing of the present invention and showing the relative positions of the record and reproducer, the casing, and the operating mechanism, represented by the feed-screw. Fig. 3 is a perspective view showing the casing in its open position and ready for application to the graphophone.

Referring now to the drawings, 5 represents the base-board of a common form of graphophone, upon which is mounted the usual graphophone mechanism, which includes a record-receiving core 6, with which is engaged a record 7, the core 6 being rotated in the usual manner, the rotating mechanism being not shown.

The feed mechanism for the reproducer comprises a feed-screw 9, which is journaled in standards, of which one is shown at 10, this feed-screw being positioned adjacent the record and separated therefrom by a slight in-

terspace, as shown. The reproducer has a supporting-arm 11, provided with a nut 12 at its lower end, which engages the threads of the feed-screw, and from the upper end of the arm the sound-tube 13 extends in a direction to support the diaphragm of the reproducer in a position for its stylus 14 to engage the record, this part of the apparatus shown being common to graphophones and forming no part of the present invention.

The sound-excluding casing consists of a base portion 15, from one side edge of which there extends upwardly a wall 16, the lower portion of which is bent outwardly into arc shape to conform to the curvature of the record 7 when the casing is in place and the upper portion of which wall is flat, as shown at 17. Longitudinally of the portion 17 of the wall there is formed a slot 18, and at the upper and lower edges of the slot there are formed grooved beads 19 and 20, each of which in the present instance consists of a strip of metal bent into U shape, the slots of the beads being disposed toward each other to receive a strip 21 of mica, which is slidably engaged with the beads and is movable loosely therein. An opening 23 is formed in the mica midway of its ends, this strip and hole being for a purpose which will be presently explained.

The back 25 and sides of the casing are formed in one piece, as shown, the sides being indicated at 26 and 27, and the lower edge of the back is hinged to the rear edge of the base 15, so that the back and sides of the casing and the top, which is carried thereby, may be moved readily into or out of coöperative relation to the front and base.

A frame 28 is secured to the upper edges of the back and sides, which frame has its inner edge grooved, as shown in Fig. 2, and in this groove is engaged a sheet of mica 30, which acts to complete the inclosure of the casing and at the same time to permit inspection of the inclosure of the casing without removing the casing. This frame 28 has a downwardly-extending finger 31 at its front edge, and in the rear thereof and parallel therewith is a second finger 32, which is carried by a transverse rail, which connects the front edges of the sides and upon which the frame 28 rests at its forward portion. These

fingers are so positioned that when the casing is closed they will lie on opposite sides of the upper edge of the front of the casing, and being of spring metal will clamp the latter to hold the parts in their proper correlative positions. As shown in the drawings, one end 27 of the casing is unbroken and rests against the base when the casing is closed, while the end 26 is cut away, so that it will take over the record-rotating mechanism.

In the application of the casing to the graphophone the casing is opened to the position shown in Fig. 3 of the drawings and is slipped with the base thereof under the record and with the front passing between the record and the feed-screw, so that the screw will lie above the curvature of the front of the casing. When the casing has been pushed sufficiently far, the back, with the sides and top, is moved on its hinges so that they will assume the positions shown in Figs. 2 and 1, at which time the record is entirely inclosed. Before swinging up the back, however, the sound-tube of the reproducer is passed outwardly through the opening 23 and is engaged with its supporting-bracket and with the stylus in engagement with the record. If the mechanism be then operated, the reproducer will move longitudinally of the record in the usual manner and will carry the mica slide with it, the slide acting to keep the front of the casing closed at all times, so that exterior vibrations are excluded from the casing, and at the same time the vibrations within the casing are retained and are brought to act directly upon the diaphragm, with the result that the sounds which emanate from the machine are not only clearer and free from confusing noises, but are much louder.

In practice mica strips or slides of different lengths may be used, and thus by using a strip which only partly closes the slot in the front of the casing some of the energy of vibration may be allowed to escape, so that the sounds given out through the sound-tube will not be so loud as when the casing is entirely closed. Furthermore, it will be understood that while in the present instance I have used tin and mica in the construction of the casing other suitable materials may be used, and any proportions may be observed

in the manufacture of the casing to adapt it to special conditions. Furthermore, the slot through which the sound-tube operates may be differently positioned to correspond to the different arrangements of the tubes on various machines. Likewise various other modifications may be used without departing from the spirit of the invention.

What is claimed is—

1. A graphophone having a casing inclosing the record and reproducer and excluding the feeding mechanism of the machine.

2. A casing for graphophones formed to inclose the record and reproducer and exclude the feeding mechanism of the machine.

3. A graphophone having a casing inclosing the record and reproducer and excluding the feeding mechanism, said casing lying with a wall thereof between the record and the feed-screw.

4. A casing for graphophones adapted to inclose the record and reproducer and to lie with a wall thereof between the record and the feed mechanism, said wall having a slot to receive the sound-tube of the reproducer and permit feeding of the reproducer.

5. A casing for graphophones adapted to inclose the record and reproducer and to lie with a wall thereof between the record and the feeding mechanism, said wall having a slot to receive the sound-tube of the reproducer and permit feeding of the reproducer, and a slide movably connected with the casing at the edges of the slot and adapted for engagement with the sound-tube for movement therewith.

6. A casing for graphophones adapted to inclose the record and reproducer and to lie with a wall thereof between the record and the feeding mechanism, said wall having a slot and guideway at the edges of the slot, and a slide engaged with the guideway for covering the slot, said slide having an opening to receive and fit the sound-tube.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

WILLIAM T. SHIELDS.

Witnesses:

HARRY H. HOLLANDER,
G. D. RILEY.

No. 651,525.

Patented June 12, 1900.

J. W. COLLINS.

RECEPTACLE FOR PHONOGRAPH RECORDS.

(Application filed Mar. 20, 1900.)

(No Model.)

Fig. 1.

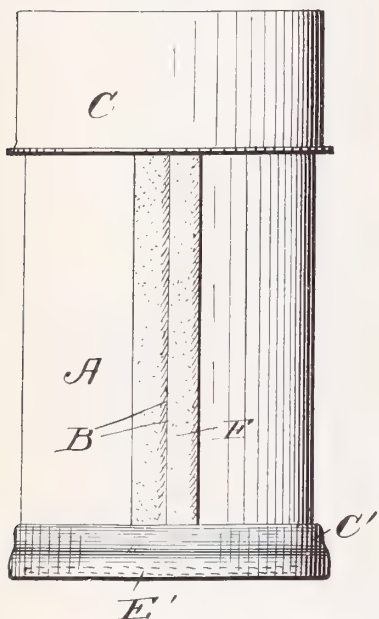


Fig. 2.

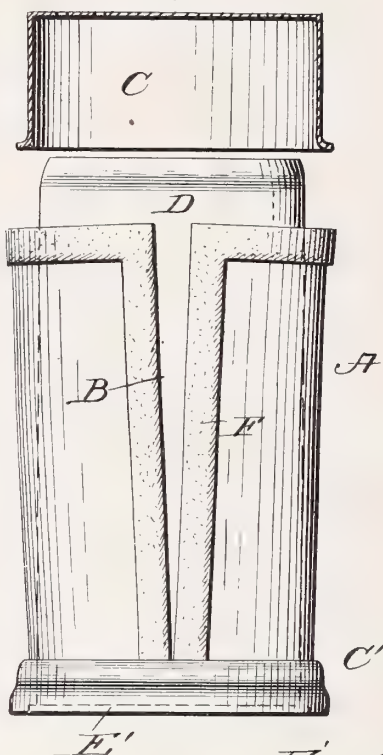


Fig. 3.

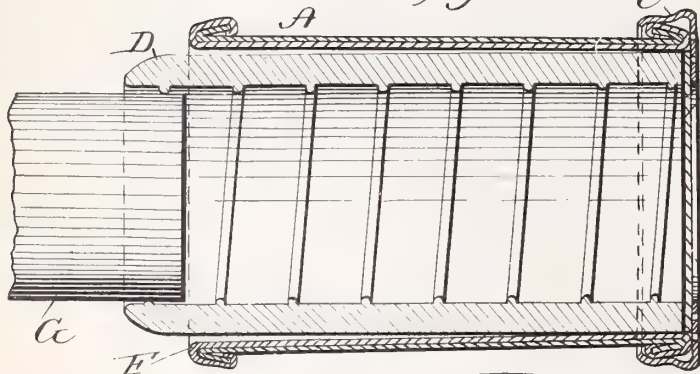


Fig. 4.

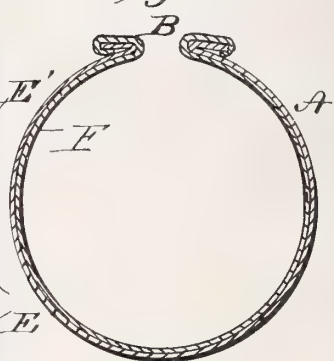
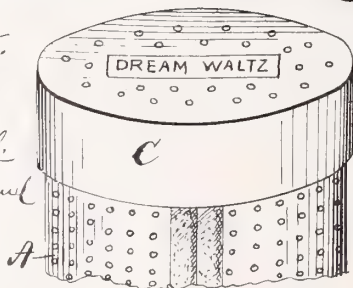


Fig. 5.



WITNESSES:

Frank L. Ormand.
William H. Ormand.

INVENTOR

John W. Collins.

BY
Parker & Sweet
ATTORNEY

UNITED STATES PATENT OFFICE.

JOHN W. COLLINS, OF WASHINGTON, DISTRICT OF COLUMBIA.

RECEPTACLE FOR PHONOGRAPH-RECORDS.

SPECIFICATION forming part of Letters Patent No. 651,525, dated June 12, 1900.

Application filed March 20, 1900. Serial No. 9,352. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. COLLINS, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Receptacles for Phonograph-Records; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention relates to improvements in receptacles or holders for phonograph-records, one object being to provide an inclosing case whereby the record will be protected from damage by abrasion or other causes during transportation, storage, or while removing it for use.

A further object of said invention is to obviate the usual handling of the record and to provide means whereby the same may be readily fitted upon the cylinder of the phonograph or other similar machine and as easily removed therefrom without its coming in contact with the hands.

To the above ends my invention consists of the novel details of construction and general arrangement of parts, as will be hereinafter fully described, and pointed out in the claims.

In the accompanying drawings, Figure 1 represents a side elevation of my improved receptacle in a closed position; Fig. 2, a similar view with the top lid removed and the inclosing case sprung open for the removal of the record; Fig. 3, a vertical longitudinal section of the same and the record, showing manner of adjusting the record upon the cylinder of the phonograph; Fig. 4, a transverse section of the main body of the receptacle or holder, and Fig. 5 a detail view showing the receptacle with perforated sides.

Similar letters of reference indicate like parts in the several figures of the drawings.

It may be observed that heretofore it has been customary in packing or storing records to first wrap or inclose each record in a sheet of cotton-batting prior to placing the same in an inclosing tube or box, and in the operation of removing the said record for use it is necessary to spread or extend two fingers of the hand into the same to withdraw it from the box, while with the other hand the covering

of cotton-batting is removed from the record prior to placing it in position upon the machine. This constant handling of the record is objectionable in many respects, and particularly in that it is liable to fall and break by accident or carelessness, as also the liability of particles of cotton-batting or foreign substances adhering to the surface of the record. These objections are obviated by my improved construction, as well as the danger of breaking or marring a record by striking the end against a hard surface common to the manner of packing heretofore employed.

In carrying out my invention the main body of my improved receptacle is composed of an open tube or cylinder A, preferably formed of thin sheet metal, having an opening B upon one side extending from the top to the bottom, the edges of which are adapted to close or abut one upon the other by compressing said tube or cylinder. The circumference of the said tube or cylinder is such that when in a closed position it fits snugly upon the record D, thereby retaining the same rigidly in place, and said tube is held closed through the medium of the overlapping edges of the upper and lower lids or caps C C'. The lower lid or cap C' is provided with a central opening E for adjusting the receptacle and its record upon the pins of a receiving box or cabinet; but when the receptacle is to be used for transporting or storing the records the opening E in said lid or cap is adapted to be closed by a perforated disk E'. The upper lid or cap C is also suitably perforated and provided with a space for marking the name of the record thereon.

The inner surface of the tube or receptacle A is provided with a lining F of cotton-flannel or other soft yielding material to prevent abrasion of the exterior surface of the record.

As already stated, the upper and lower lids or covers of the tube or receptacle A are perforated to provide suitable ventilation of the record, and, if desired this matter of ventilation may be further enhanced by perforating the main wall of the tube or receptacle proper, as shown in Fig. 5.

The construction of my invention being as above described, it will be observed that when the record is to be used the upper lid or cover

C of the receptacle is removed, thereby allowing the edges of the opening B in said receptacle to spring apart to release the record, which may then be adjusted in position upon the spindle or cylinder G of the phonograph and the receptacle slipped therefrom, leaving the record in place for operation. To remove the record, the receptacle A is slipped in place thereon and, being slightly compressed by the hand, grasps the record and allows the same to be readily removed from the machine, and the lid or cover C being adjusted in position the record is securely held in place within the receptacle.

15 Having thus described my invention, I claim as new and useful—

1. A receptacle for phonograph-records, consisting of the compressible tube or cylinder A, provided with a soft elastic lining F,

and with the lids or covers C, C', substantially 20 as specified.

2. A receptacle for phonograph-records, consisting of the compressible tube or cylinder A, provided with a soft elastic lining F, and the perforated lids or covers C, C', substantially 25 as specified.

3. A receptacle for phonograph-records, consisting of the compressible tube or cylinder A, provided with the perforated lids or covers C, C', the lower lid being provided with a central opening E adapted to receive a disk 30 E' substantially as specified.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN W. COLLINS.

Witnesses:

THOMAS D. COLLINS,
PARKER H. SWEET, Jr.

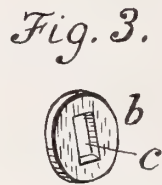
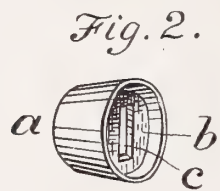
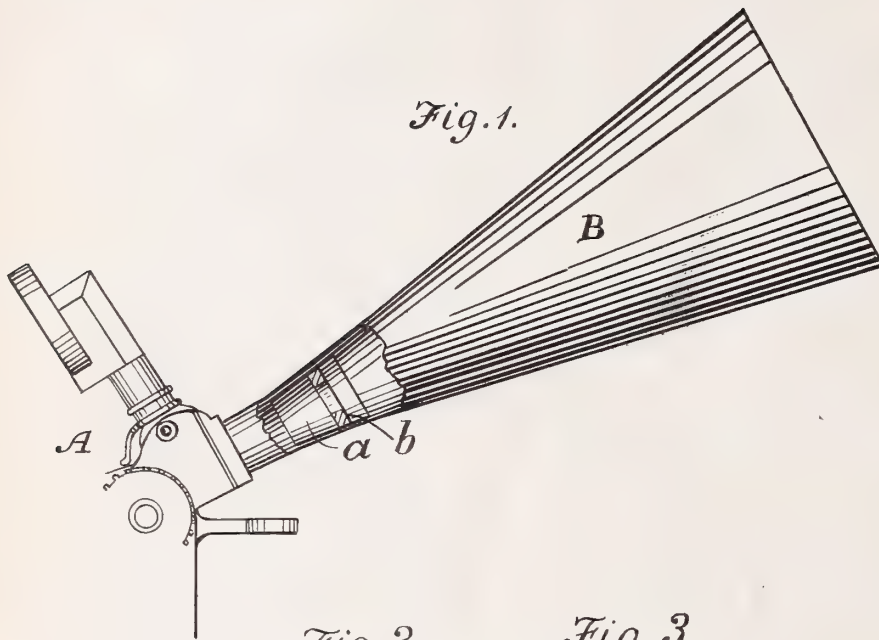
No. 651,843.

Patented June 19, 1900.

E. C. GENEUX.
PHONOGRAPH.

(Application filed June 9, 1899.)

(No Model.)



Witnesses:

H. A. Daniels

C. B. Towles

Inventor:

Emile C. Geneux

By Thomas P. Simpson

Attorney

UNITED STATES PATENT OFFICE.

EMILE CEASAR GENEUX, OF JEANERETTE, LOUISIANA.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 651,843, dated June 19, 1900.

Application filed June 9, 1899. Serial No. 719,947. (No model.)

To all whom it may concern:

Be it known that I, EMILE CEASAR GENEUX, a citizen of the United States, residing at Jeanerette, in the parish of Iberia and State of Louisiana, have invented certain new and useful Improvements in Phonographs or Gramophones or Graphophones; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention has for its object to prevent the sound from acquiring a metallic ring as it strikes the horn just before it passes into the phonograph or graphophone, as this prevents an imitation of the human voice. I accomplish this by using a tube with a centrally-perforated diaphragm and made of material which is a bad conductor of sound. Cork and rubber diaphragms have been heretofore employed to deaden or decrease the volume of sound, as shown and described in United States Patent No. 534,543 of the year 1895; but they would not prevent the sound-waves from striking the metallic horn just before going into the phonograph or graphophone.

Figure 1 of the drawings represents a phonograph with my invention applied; Fig. 2, a perspective view of my ventrologue, and Fig. 3 a detail view of the diaphragm.

In the drawings, A represents the phonograph, B the horn, and *a b c* the ventrologue. The ventrologue consists of the conical tube *a*, which fits snugly within the small end of the horn B and contains across the middle a diaphragm *b*, with the central aperture *c*, the diaphragm made of a material which is a non-conductor of sound. If my ventrologue is applied to a fifty-six-inch horn, a person can place his head within the horn without being inconvenienced by the metallic sound, whereas without it the ear is very much affected. A person who is nearly deaf can put his head in the horn and hear with great clearness.

What I claim as new is—

As an attachment for talking-machines, the apertured diaphragm *b* arranged within the tube *a*, the whole adapted to be placed within a sound-passage for the purpose set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

EMILE CEASAR GENEUX.

Witnesses:

CHAS. B. LLOYD,
A. F. PETITFILS.

No. 651,904.

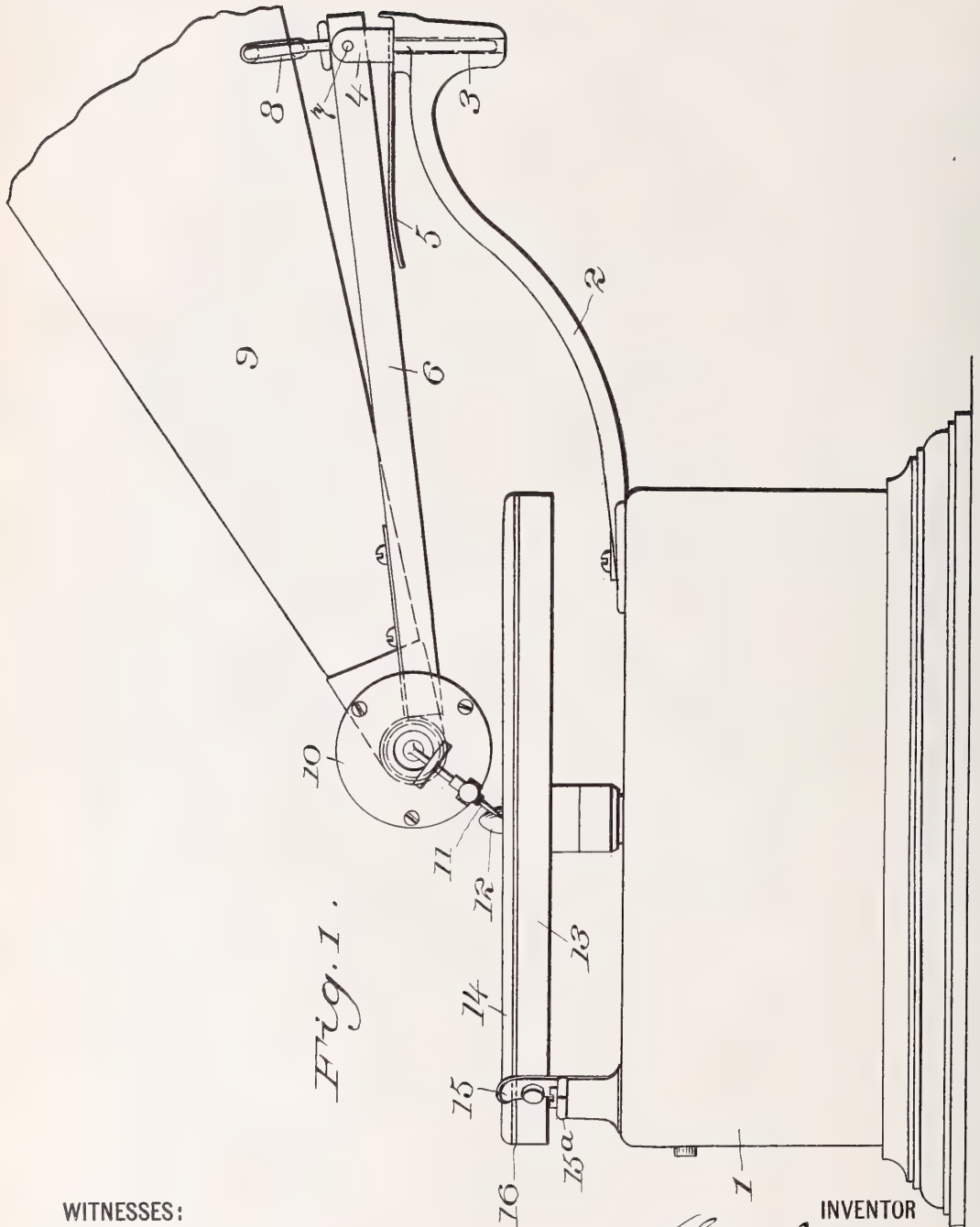
Patented June 19, 1900.

L. P. VALIQUET.
GRAMOPHONE MOTOR.

(Application filed Apr. 21, 1899.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES:

Lilian Foster
N. H. Pumphrey.

INVENTOR

Louis P. Valiquet
BY *A. W. Schmidt*
ATTORNEY

No. 651,904.

Patented June 19, 1900.

L. P. VALIQUET.
GRAMOPHONE MOTOR.

(Application filed Apr. 21, 1899.)

(No Model.)

5 Sheets—Sheet 2.

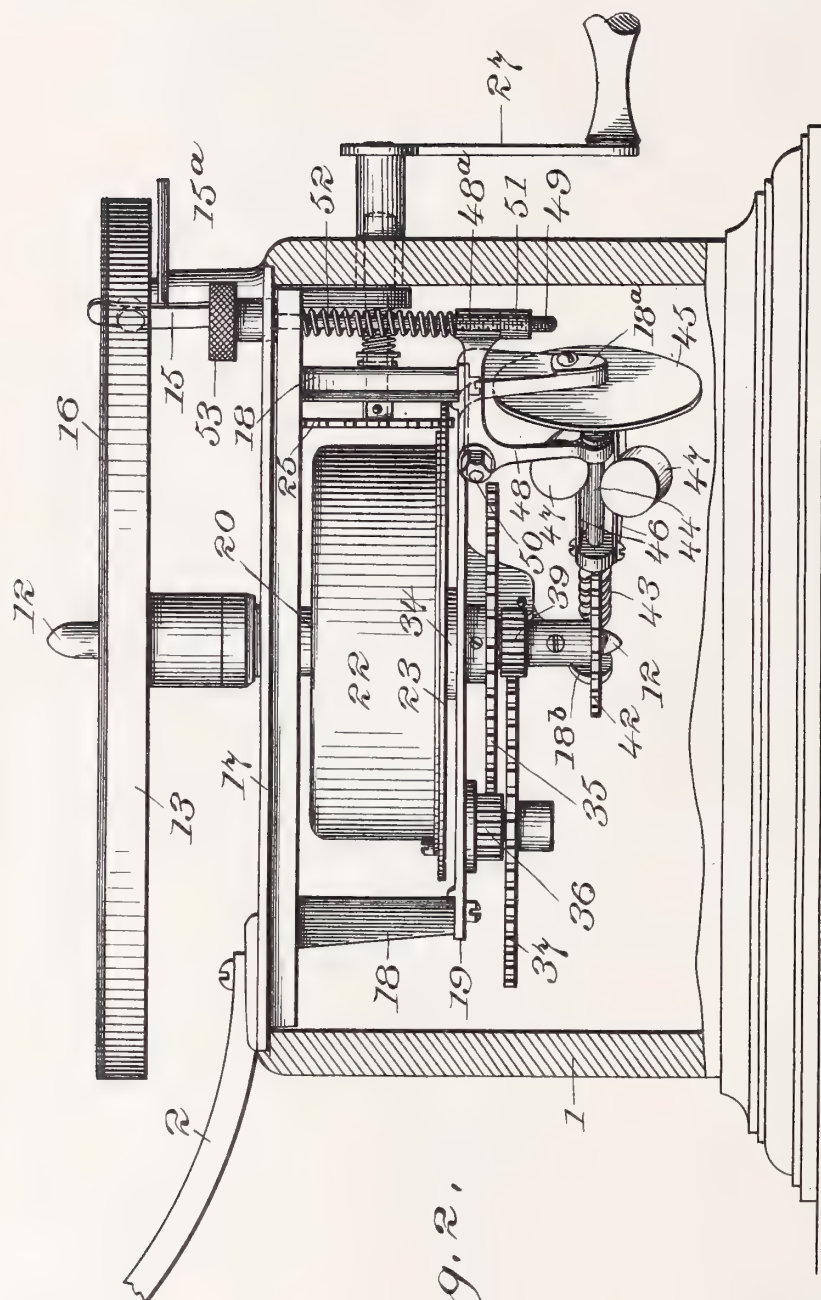


Fig. 2.

WITNESSES:

Lillian Foster
W. H. Humphrey.

INVENTOR

Louis P. Valiquet

BY

W. H. Humphrey
ATTORNEY

No. 651,904.

Patented June 19, 1900.

L. P. VALIQUET.
GRAMOPHONE MOTOR.

(Application filed Apr. 21, 1899.)

(No Model.)

5 Sheets—Sheet 3.

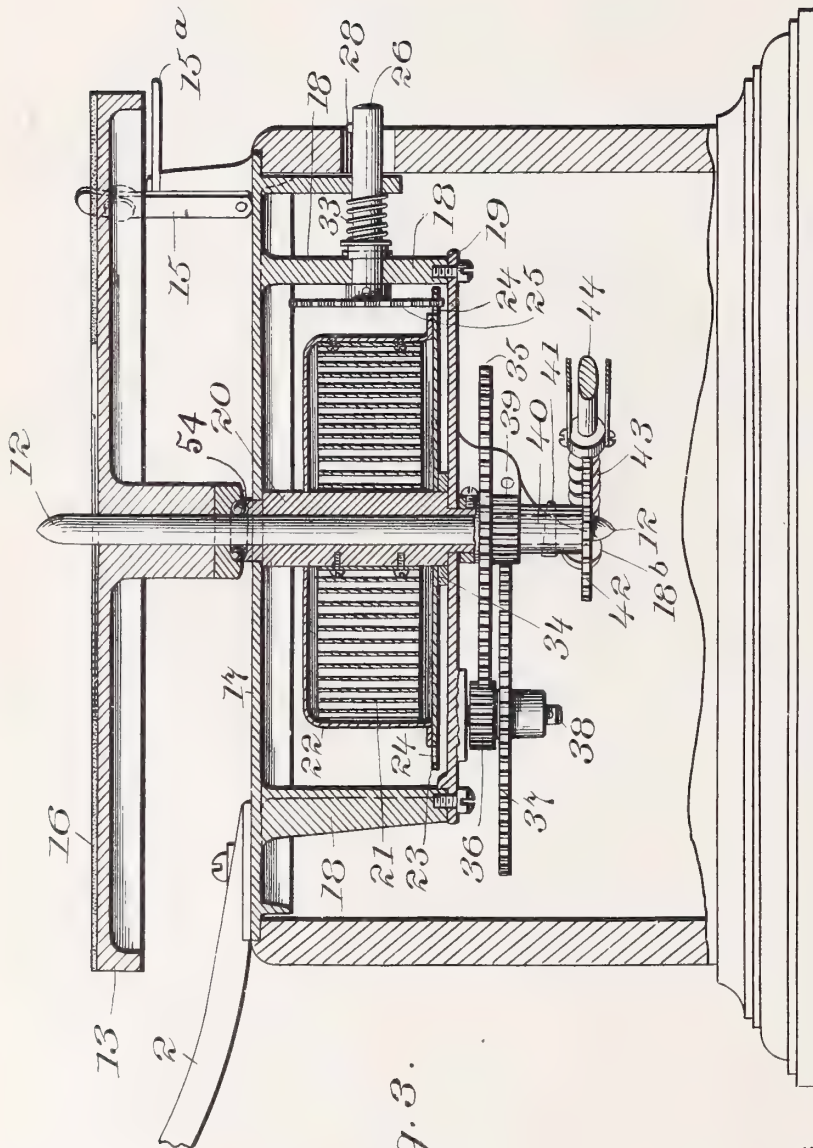


Fig. 3.

WITNESSES:

Lilian Forster
W. H. Humphrey.

INVENTOR

Louis P. Valiquet
BY *T. Valiquet*
ATTORNEY

No. 651,904.

Patented June 19, 1900.

L. P. VALIQUET.
GRAMOPHONE MOTOR.
(Application filed Apr. 21, 1899.)

(No Model.)

5 Sheets—Sheet 4.

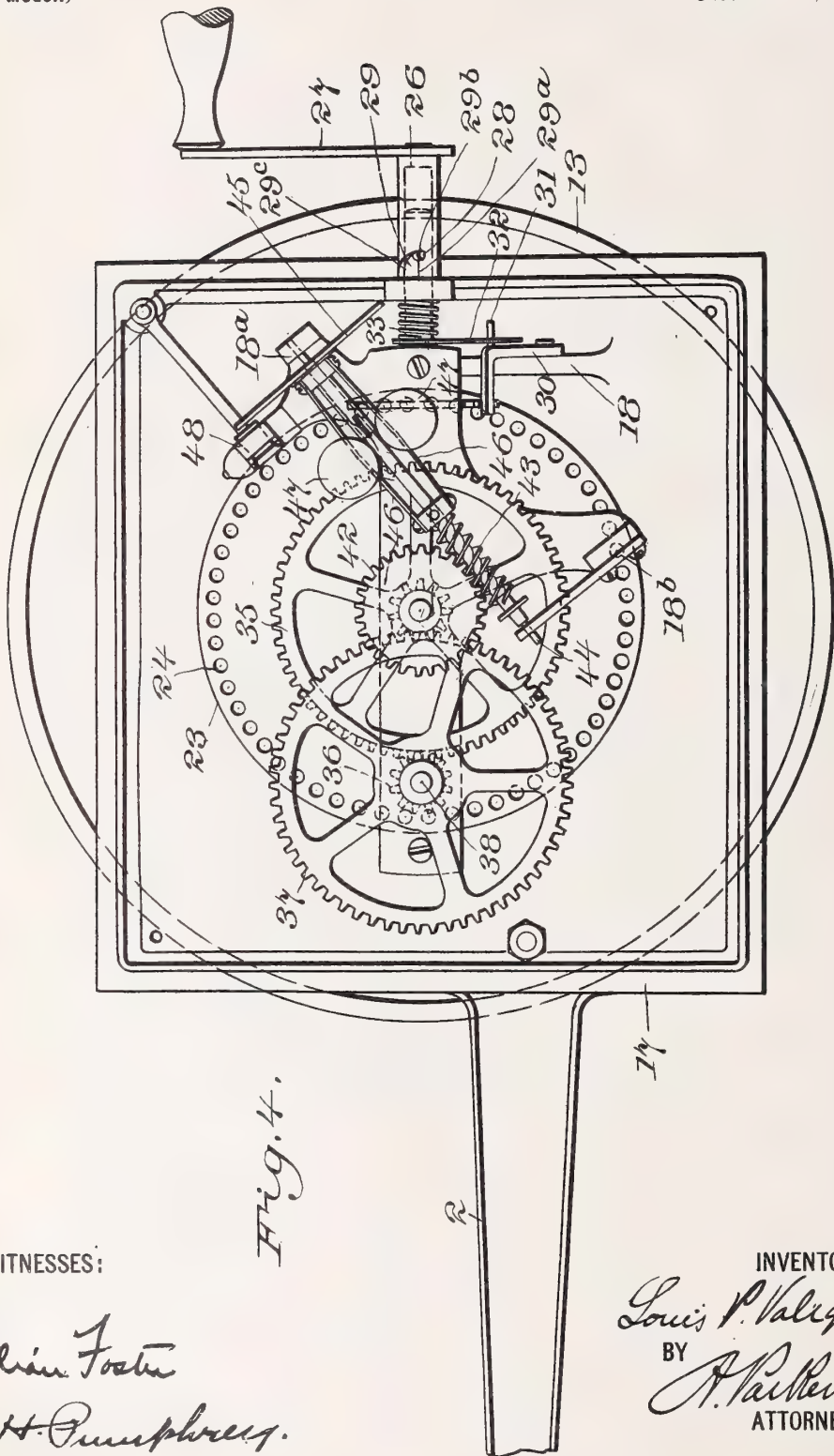


Fig. 4.

WITNESSES:

Lillian Foster
W. H. Humphreys.

INVENTOR

Louis P. Valiquet
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A. P. Schmidt
ATTORNEY

No. 651,904.

Patented June 19, 1900.

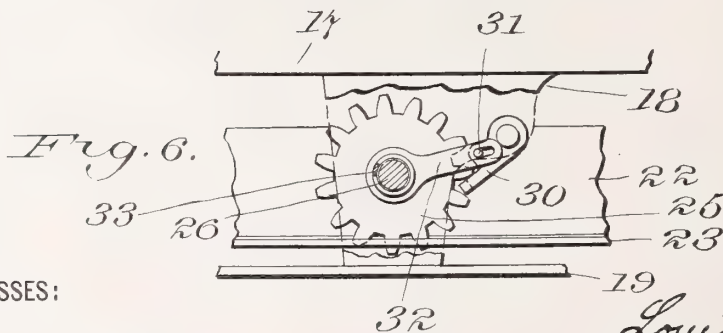
L. P. VALIQUET.
GRAMOPHONE MOTOR.

(Application filed Apr. 21, 1899.)

(No Model.)

5 Sheets—Sheet 5.

Fig. 5.



WITNESSES:

Liban Fortin
M. H. Humphreys

INVENTOR

Louis P. Valiquet

BY

A. A. Heidrich

ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL TALKING MACHINE COMPANY, OF SAME PLACE.

GRAMOPHONE-MOTOR.

SPECIFICATION forming part of Letters Patent No. 651,904, dated June 19, 1900.

Application filed April 21, 1899. Serial No. 713,984. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Gramophone-Motors, of which the following is a specification.

My invention relates to mechanical movements and spring-motors, and is more specifically designed to produce an improved compact noiseless spring-motor for rotating the sound-record on a gramophone, the said motor being so designed that it can be wound up without stopping the mechanism. The invention also includes certain improvements in the mechanism of the gramophone cooperating with said motor.

The preferred form of apparatus embodying my invention is illustrated in the accompanying five sheets of drawings, in which—

Figure 1 is a side elevation of a gramophone containing my motor and embodying my improvements. Fig. 2 is a vertical section at right angles to the plane of Fig. 1, showing the mechanism within the casing. Fig. 3 is a similar section taken through the center of the mechanism itself. Fig. 4 is a bottom view of the top plate and mechanism carried thereby. Fig. 5 is a detail plan view of the record-carrying table. Fig. 6 is a detail of the locking-pawl.

Throughout the drawings like reference figures refer to like parts.

The motor-casing and base of the gramophone is in the form of any convenient box 1. From the top plate of this casing is supported the usual projecting arm 2, which in its outer end has a vertical bearing for the pivot 3, upon which is mounted any convenient form of pivot-piece 4 and the supporting-spring 5. The swinging arm 6 is hinged to the pivot-piece 4 by the horizontal pivoted shaft 7 and carries any convenient form of support 8 for the horn 9, which extends from the sound-box 10 on the end of the arm 6, said sound-box having the reproducing-stylus 11, engaging with the undulatory groove of the sound-record 14. This sound-record is supported on a revolving table 13 of the same general form as now in use, said table being carried by a vertical rotating shaft 12, which is also

a centering-shaft for the sound-record 14, having its upper end preferably tapered to a point, as shown. Any convenient form of brake 15 cooperates with said rotating table, the form which I have illustrated in Figs. 1 and 2 being operated by the eccentric lever 15^a.

Instead of covering the entire upper face of the table 13 with a layer of baize cloth or similar frictional material, as is customary, and employing a thumb-screw on the shaft 12 to hold the record down on the table I simply employ a narrow annular strip 16 of baize or other frictional material and dispense with the ordinary thumb-screw.

While the body of the casing 1 may preferably be made of wood, the top plate 17 is formed of metal, and this plate carries the entire mechanism of the record-rotating motor. From this plate project any suitable number of studs 18 18, which in the preferred construction support the bed-plate 19 for the mechanism of the motor, said bed-plate being parallel to the top plate 17. Journaled in one or both of these plates is the rotating sleeve 20, within which is journaled the previously-described shaft 12, which projects through both said plates 17 and 19. To the exterior of the sleeve 20 is fastened one end of the spiral spring 21, the other and outer end of said spring being attached to the inclosing drum 22. The plate 23 is fastened to the lower face of said drum and preferably forms the inclosing lower wall of said drum, and in the projecting portion of said plate or other rigid projecting flange of the drum 22 I form a circular series of perforations 24. A star-wheel 25, at right angles to said plate 23, has projecting teeth which enter said perforations 24 and engage the perforated flange of the drum formed by the plate 23. This star-wheel 25 is mounted on the winding-shaft 26, which is journaled in rigid projections from the top plate 17, and the winding-crank 27 is adapted to engage said winding-shaft, but to be detachable therefrom at will, by means of the pin or projection 28 in the shaft 26 and the engaging notch 29 therefor in the end of the sleeve of the crank 27. This engaging notch 29 has an engaging edge 29^a, parallel to the axis of the sleeve, and preferably terminates at its inner end in the semicircular recess 29^b. The other side has a helical dis-

charging edge 29°. A locking-pawl 30 of any convenient shape is pivoted to a suitable projection from the top plate 17 and engages the star-wheel 25 of the winding mechanism to prevent the backward rotation of the same. This pawl has a pin 31, engaging a slotted arm 32, mounted on the shaft 26 and kept in frictional contact with the said shaft or some projection thereon by means of the spiral spring 33 or equivalent means.

The washer or collar 34 forms a bearing for the lower face of the spring-drum and keeps the same at a proper distance from and parallel to the bed-plate 19. The gear-wheel 35 is fastened to the lower end of the sleeve 20 (said sleeve projecting through the bed-plate 19 for this purpose) by means of the set-screw or other equivalent means, as shown. This gear-wheel 35 meshes with the pinion 36, which is rigidly connected to a gear-wheel 37, both rotating freely and in unison on the stud-shaft 38. The gear-wheel 37 meshes with the pinion 39, fastened to the vertical rotating shaft 12 by any convenient means, such as the sleeve 40 and key 41. This sleeve 40 also carries the worm-gear 42, which meshes with the worm 43 of high pitch, formed on shaft 44, journaled in projections 18^a 18^b from the main frame, said shaft being in a plane at right angles to the vertical rotating shaft 12. Preferably I make this worm 43 double-threaded to insure smoothness of action. On the other end of the shaft 44 is loosely mounted the axially-sliding friction-plate 45, attached to a collar on said shaft by means of the spring-strips 46 46, which carry the ordinary governor-weights 47 47. This friction-plate 45 coöperates with the brake-lever 48, which I preferably make in the form of a bell-crank, the other arm being perforated at 48^a to permit the passage of a screw-shaft 49 therethrough. This brake-lever is pivoted to the main frame at 50. The screw-shaft 49 carries the stop 51 at its lower end, and the spiral spring 52, which is always under compression, holds the sleeved arm 48^a of the brake-lever and the screw-shaft 49, which engages therewith, down. The sleeve on the end of the arm 48^a is internally threaded and loosely meshes with the thread on the shaft 49, so that by turning said shaft 49 through the agency of the thumb-screw 53 or equivalent device the position of the brake-arm can be adjusted. The stop 51 limits the downward motion of the sleeved arm 48^a and so establishes a limit of speed for the governor.

The mode of operation of my invention is as follows: The winding-crank 27 being in position and the brake 15 engaging the rotating table 13, the machine can be wound up by turning the crank from left to right in the direction of the hands of a watch, the engaging edge 29^a or recess 29^b of the notch in the crank-sleeve bearing against the pin or projection 28 and winding-shaft 26. This of course rotates the star-wheel 25 and tends to turn the frictional arm 32 in the same direc-

tion and does turn said arm far enough to lift the locking-pawl 30 out of engagement with the star-wheel by means of the pin 31 engaging the slot in said frictional arm 32. Of course further rotation of the frictional arm 32 is prevented, and it merely slips around on the winding-shaft. The star-wheel 25 noiselessly engages the circular line of perforations 24 in the plate 23 and rotates the same, together with the spring-drum 22, thereby winding up the spring 21, contained therein. When the operator desires to stop winding, he merely reverses the motion of the crank and the same disengages itself from the winding-shaft by reason of the helical discharging edge 29° of the notch 29 coming in contact with the pin or projection 28 on the winding-shaft. Backward rotation of the winding-shaft is prevented, of course, by reason of the fact that the slightest backward turn causes the friction-arm 32 to travel with it far enough to bring the locking-pawl 30 into engagement with the star-wheel 25.

Whenever the brake 15 is taken off, the motor will begin to run by reason of the fact that the spring 21 will cause the sleeve 20 to slowly rotate, and this will cause the gear-wheel 35 to rotate at the same rate. This motion is transmitted through the pinion 36 and gear-wheel 37 back to the pinion 39 on the vertical rotating shaft 12, causing the same to rotate at a much higher rate of speed and carrying with it the table 13 and record 14, resting thereon. This shaft 12 is of course fastened to the table 13 by means of a projecting boss on said table, as shown, or otherwise. Said boss runs on ball-bearings 54 in the upper end of the sleeve 20, thereby forming a supporting-bearing for the shaft 12 and all mechanism carried thereby. With the shaft 12 rotates the worm-gear 42, and this causes the high-speed worm 43 to rotate the governor-shaft 44. By the phrase "high-speed" or "high-pitch" worm I mean a worm the pitch angle of whose thread to the axis of the worm is great enough to enable motion to be transmitted from the worm-gear to the worm as well as from the worm to the worm-gear, it being a well-known fact that in the more ordinary forms of low-pitch gearing motion can only be transmitted from the worm to the worm-gear, any attempt to run the gearing backward resulting in a locking of the mechanism through the friction created. The centrifugal action of the governor-weights 47 pulls out the springs 46, thereby drawing the axially-sliding friction-plate 45 toward and into frictional contact with the brake 48. This brake can be adjusted by means of the thumb-screw 53, as before described, and thus the speed of the governor adjusted.

It is evident that when the winding-gear is at rest it is a means for holding the spring-drum 22 rigid with reference to the main frame; but it is also evident that said winding-gear can be operated to further wind up

the spring even while the motor mechanism is in operation. The apparatus thus constitutes what is called a "continuous-winding motor."

5 The sound-record 14 is centered by the shaft 12 passing through the center of the table 13, and by reason of the fact that the frictional material 16 is arranged in annular form in the shape of a narrow strip about the outer circumference of the table close contact is insured between the outer circumference of the record and said frictional material, and the friction so created, operating at or near the circumference of the record, where the resistance of the stylus is itself applied, exerts sufficient force to turn the record against the resistance afforded by the stylus 11 without the use of any thumb-screw or other means for forcing the record down upon the table than the weight of said record and the downward pressure of the stylus thereon.

When the reproducer is swung to one side to put in a new needle or to put a new record on the machine, the supporting-spring 5 holds the arm 6 up and prevents the reproducer from dropping on the table and being injured.

30 The advantages of my invention, in addition to those above referred to, are the neatness and compactness of the motor mechanism, which is all carried by the top plate 17 of the motor-casing, so that by removing said top plate the entire mechanism is taken with it and exposed to view for inspection, oiling, or repair. The driving mechanism, winding mechanism, and governor mechanism are all noiseless in their action and do not require the exact cutting of as many gear-teeth as is the case with ordinary clockwork, the worm-gear on the governor taking the place of the usual train of several gear-wheels and the winding-gearing operating without the rattling of the ordinary ratchet. The advantage of the continuous-winding feature of my invention lies in the fact that where the motor runs down in the middle of the reproduction of a record it can be wound up again without stopping the mechanism, while in the ordinary form of motor the winding up thereof immediately takes the power off the rotating shaft and stops the action of the motor during the operation of winding.

55 It is evident, of course, that various changes could be made in the details of the apparatus disclosed without departing from the spirit and scope of my invention so long as the relative arrangement of parts shown in the drawings or the general principle of operation described in the specification is preserved. Thus, for instance, it is immaterial which of the two elements connected by the spring 21 operates to drive the rotating shaft so long as the other can be held rigid with reference to the main frame. Other forms of winding-gear might be substituted for that shown, other forms of governor might be employed,

the intermediate gearing between the sleeve 20 and the shaft 12 might be modified in many ways, the form of spring-drum might be changed, and various of the novel sub-combinations of elements described might be used with other apparatus and for other purposes than those specified; but all these I consider changes of form and not of substance and still within the scope of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. In a mechanical motor the combination of the motor-casing, the top plate removably attached to said casing, the frame supported from the under side of said plate, the sleeve journaled in said frame, the rotating vertical driving-shaft journaled in the sleeve, extending therethrough and projecting through the top plate, the turn-table carried by said shaft, the gear-wheel on the sleeve, the pinion on the shaft, intermediate gearing from said gear-wheel to said pinion supported on the frame, the drum journaled on the sleeve, the spiral spring in said drum having one end fastened to the drum and the other to the sleeve, and the winding-gear mounted in the frame and directly connected to the drum.

2. In a mechanical motor the combination of the motor-casing, the top plate removably attached to said casing, the frame supported from the under side of said plate, the sleeve journaled in said frame, the rotating vertical driving-shaft journaled in the sleeve, extending therethrough and projecting through the top plate, the turn-table carried by said shaft, the gear-wheel on the sleeve, the pinion on the shaft, intermediate gearing from said gear-wheel to said pinion supported on the frame, the drum journaled on the sleeve, the spiral spring in said drum having one end fastened to the drum and the other to the sleeve, and the winding-gear mounted in the frame and directly connected to the drum, together with the worm-wheel on the rotating driving-shaft, the governor and the shaft for said governor provided with a worm-gear meshing with the worm-wheel, all said governor parts and shaft being also journaled in the frame.

3. In a gramophone the combination of the vertical pivot-bearing for the swinging arm supported on a projection from the gramophone-base, a pivot-piece journaled in said pivot-bearing, a swinging arm hinged to said pivot-piece on a horizontal axis, and the supporting-spring projecting from said pivot-piece and adapted to engage and support the swinging arm when the reproducer is not supported by the sound-record.

Signed by me at New York city, New York, this 18th day of April, 1899.

LOUIS P. VALIQUET.

Witnesses:

A. PARKER-SMITH,
LILIAN FOSTER.

No. 651,905.

Patented June 19, 1900.

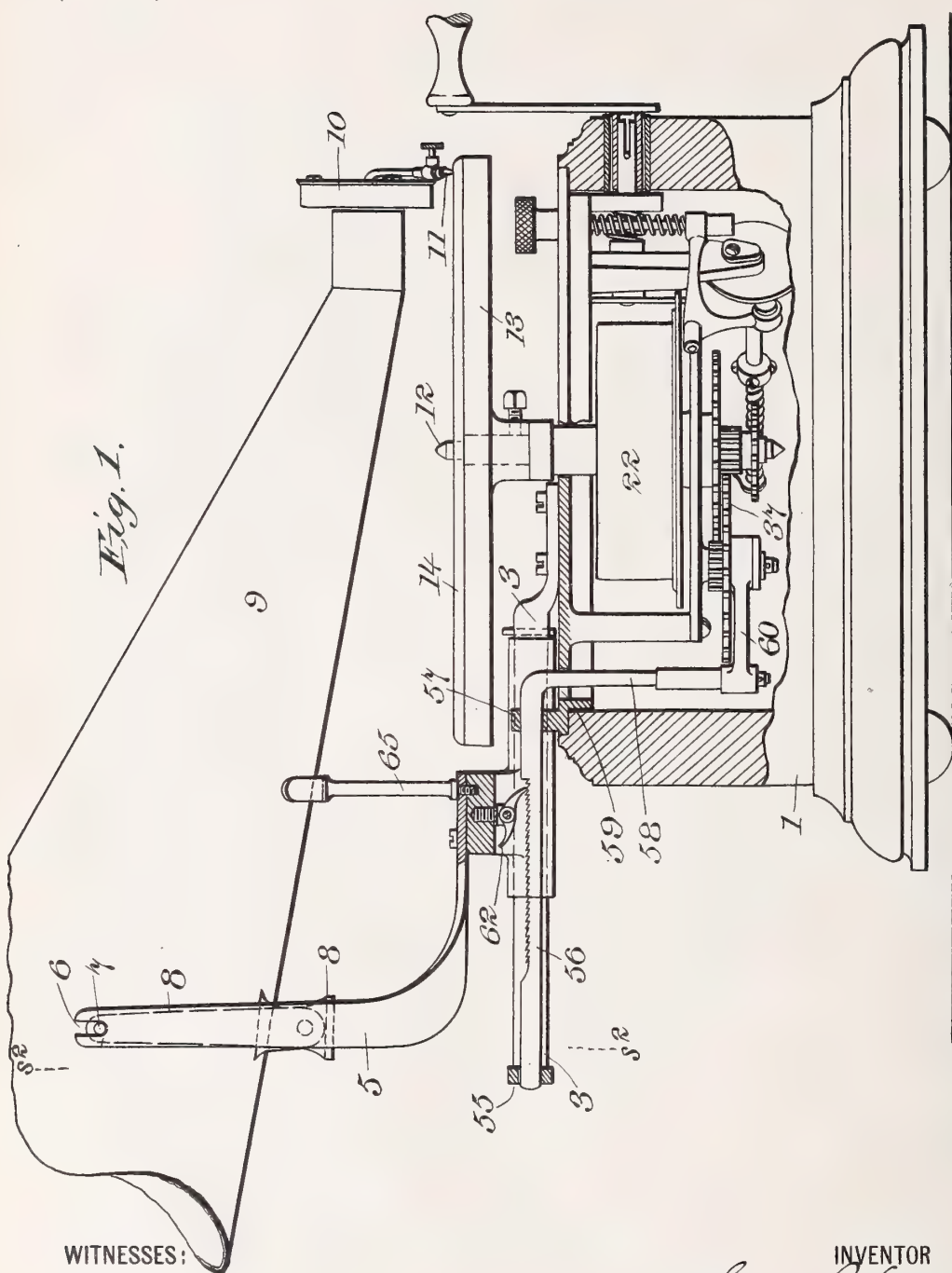
L. P. VALIQUET.

INTERMITTENT FEED FOR TALKING MACHINES.

(Application filed Nov. 27, 1899.)

(No Model.)

2 Sheets—Sheet 1.



WITNESSES:

Thos. T. Smith.
W. H. Humphrey -

INVENTOR

INVENTOR
Louis V. Valyueo
BY A. Van Rensselaer
ATTORNEY

No. 651,905.

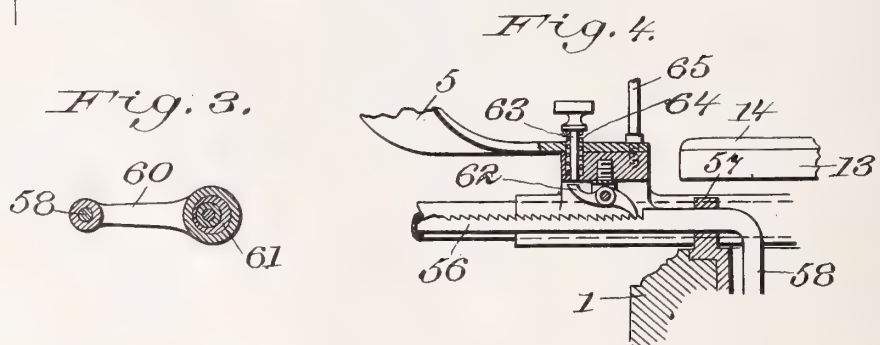
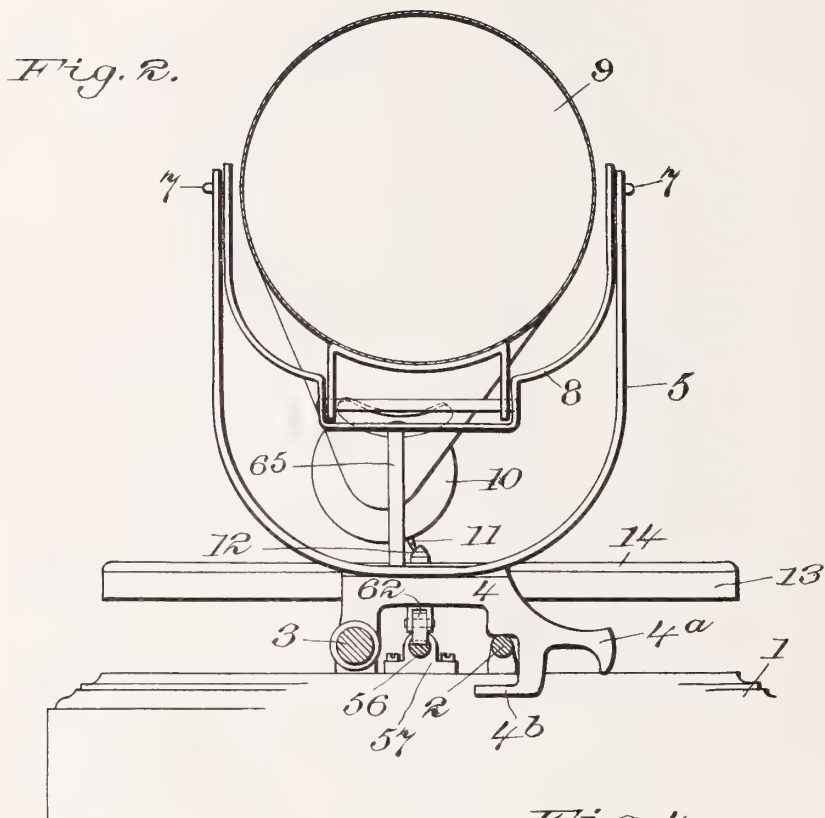
Patented June 19, 1900.

L. P. VALIQUET.
INTERMITTENT FEED FOR TALKING MACHINES.

(Application filed Nov. 27, 1899.)

(No Model.)

2 Sheets—Sheet 2.



WITNESSES:

Thos. T. Smith.
W. H. Humphrey.

INVENTOR
Louis P. Valiquet
BY *A. W. Schmidt*
ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS P. VALIQUET, OF NEW YORK, N. Y., ASSIGNOR TO THE UNIVERSAL TALKING MACHINE COMPANY, OF SAME PLACE.

INTERMITTENT FEED FOR TALKING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 651,905, dated June 19, 1900.

Application filed November 27, 1899. Serial No. 738,281. (No model.)

To all whom it may concern:

Be it known that I, LOUIS P. VALIQUET, a citizen of the United States of America, and a resident of New York city, county of New York, State of New York, have invented certain new and useful Improvements in Intermittent Feeds for Talking-Machines, of which the following is a specification.

My invention relates to talking-machines in general, and more specifically consists of an improved construction of talking-machine designed to employ sound-records in the shape of a flat disk.

The preferred form of apparatus embodying my invention is shown in the accompanying two sheets of drawings, in which—

Figure 1 is a side elevation and partial section of the complete talking-machine. Fig. 2 is an end elevation and partial section on line 2 2 of Fig. 1. Fig. 3 is a detail of the eccentric and pitman coöperating therewith to produce the reciprocating action, and Fig. 4 is a detail of a modification.

Throughout the drawings like reference-figures refer to like parts.

The casing 1, forming the base of the machine, contains a spring-motor or record-rotating apparatus driven by a spring concealed in the drum 22. The mechanism produces regular rotation of the shaft 12 and substantially conforms to the construction described and illustrated in my pending application, Serial No. 713,984, filed April 21, 1899. It will not therefore be further described.

The table 13, supported by the shaft 12 and rotated thereby, is designed to carry a flat-disk-shaped sound-record 14. The sound-box 10 is of the usual construction, the reproducing-stylus 11 coöperating with the groove in the sound-record. The reproducer sound-box is carried on the end of the horn 9, which is supported by the swinging link 8, pivoted at its center to the under side of the horn 9 and having outwardly-extending pivots 7 at its extremities. These pivots 7 fit into the slots 6 in the upper ends of the U-shaped upwardly-extending fork 5. This fork is mounted on the sliding carriage 4, which slides to and from the record on a line passing through the axis of shaft 12, being guided by the guide-rod 3, which is fastened to the upper bed-

plate of the motor. A parallel rod 2 serves as a rest for the other side of the carriage 4, and the cross-piece 55 connects the outer ends of these rods 2 and 3. A reciprocating ratchet-rod 56 is guided in this cross-piece 55 and in the lug 57, formed on the bed-plate of the motor. This ratchet-rod has a downwardly-extending portion 58 at right angles to its main portion, and this extension 58 passes down through a slot 59 in the bed-plate of the motor. Upon the lower end of this extension is pivoted the eccentric-rod or pitman 60, which coöperates with the eccentric 61, formed on the hub of the gear 37 of the motor or rigidly connected thereto.

Pivoted on the under side of the carriage 4 is the pawl 62, adapted to normally fall into engagement with the ratchet 56. The carriage 4, however, has an extension 4^a, by which it may be swung up on the guide-rod 3 as a center, so as to remove the pawl 62 from engagement with the ratchet. The horizontally-extending lower lug 4^b prevents the carriage from being tipped too far by striking the under side of the rod 2. An upright 65 may be attached to the carriage for the purpose of supporting the horn and sound-box when the carriage is tipped up to be slid back. This upright is of such length that when the carriage is down in its operative position the upright does not reach the horn, but the same is supported at its smaller end solely by the reproducing-stylus resting on the record.

In the modification shown in Fig. 4 the plunger 63, which is normally held up by the spiral spring 64, will, when depressed, strike the rear end of the pawl 62 and swing the same out of engagement with the ratchet 56 without tipping up the carriage 4, as heretofore described.

The mode of operation of my invention is as follows: When the talking-machine is to be operated, the motor is wound up in the well-known way and the carriage 4 is slid to the right (see Fig. 1) by disengaging the pawl from the ratchet by swinging up the carriage by means of the extension 4^a if the construction shown in Figs. 1 and 2 is used, or by disengaging the pawl through the action of the plunger 63 if the construction shown in Fig. 4 is employed. The carriage being slid to the right, the stylus 11 is dropped into engage-

ment with the starting-point of the sound-record 14. When the motor starts into operation rotating the sound-record, a reciprocating motion is given to the ratchet 56 by means of the eccentric 61 and pitman 60. This eccentric is so designed as to give the carriage just the same amount of feed as the stylus 11 requires to traverse the record during the time of one rotation of said eccentric 61. The swinging link 8 constitutes a yielding connection between the carriage and the reproducer, so that the step-by-step feeding action of the carriage will not interfere with the continuous movement of the stylus along the same line of motion. During the right-hand stroke of the ratchet 56 the pawl runs over one tooth and catches ready to feed the carriage toward the left on the return or left-hand stroke of the ratchet. In packing the machine the horn and reproducer can be promptly removed from the carriage by lifting them, together with the swinging link 8, up from the supporting-fork 5. When the end of the record is reached, the reproducer can be lifted up and the carriage 4 slid back to the starting-point in the manner before described.

The advantages of my invention consist in the simple and inexpensive method of feeding embodied in the construction shown and in the convenient mounting of the horn and reproducer in the fork carried by the feed-carriage. The pawl and ratchet is a much simpler and more convenient feed apparatus than the ordinary feed-screw and is more easily connected to the motor. It is automatic in its action and in engagement or disengagement and requires no oiling. By giving the reproducer a positive feed in the manner described, all possibility is avoided of the mechanism sticking and thereby compelling the stylus to jump back and cut across the record, thereby ruining the same, as sometimes occurs with machines in which the reproducer is fed by the action of the sound-record groove instead of being fed by a positive actuating mechanism, as is the case with my invention.

Of course various changes could be made in the details of construction illustrated without departing from the spirit and scope of my invention so long as the principle of operation described or the general relative arrangement of parts illustrated is preserved. Other forms of step-by-step feed mechanism could be employed, and they might be operatively connected to the record-rotating mechanism in different ways. The particular form of sliding carriage and guideways shown might be changed and the reproducer otherwise mounted on the carriage; but all such modifications I should consider matters of detail only and still within the boundaries of my invention.

Having, therefore, described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of the rotating sound-

record, the sliding reproducer-carriage, the reproducer hinged thereto and resting on the record by gravity, the record-rotating mechanism, and the step-by-step feed mechanism for the carriage operated by the record-rotating mechanism.

2. The combination of the rotating sound-record, the sliding reproducer-carriage, the reproducer hinged thereto and resting on the record by gravity, the record-rotating mechanism, and the reciprocating-ratchet feed mechanism for the carriage operated by the record-rotating mechanism.

3. The combination of the rotating sound-record, the sliding reproducer-carriage, the reproducer hinged thereto, by a connection slightly yielding in the direction of travel of the carriage, the record-rotating mechanism, and the step-by-step feed mechanism for the carriage operated by the record-rotating mechanism.

4. The combination of the rotating sound-record, the sliding reproducer-carriage, the reproducer hinged thereto, the record-rotating mechanism, the step-by-step feed mechanism for the carriage operated by the record-rotating mechanism, and means whereby the feed mechanism may be thrown out of gear on the return motion of the carriage.

5. The combination of the rotating sound-record, the sliding reproducer-carriage, the reproducer hinged thereto by a connection slightly yielding in the direction of travel of the carriage, the pawl on said carriage, the reciprocating ratchet coöperating therewith, the record-rotating mechanism, the eccentric rotated by the said rotating mechanism, and the pitman for transmitting motion from said eccentric to said reciprocating ratchet.

6. In a talking-machine the combination of the carriage the upwardly-extending fork having slotted ends, and the horn having a sound-box on its end and removably mounted in the slotted ends of the fork, by means of a swinging link pivoted at its center to the under side of the horn and having pivots on each extremity adapted to drop into the slots in the ends of the fork.

7. The combination in a talking-machine of the rotating sound-record, the reproducer-carriage sliding on guides and hinged to swing in a plane at right angles to the line of sliding motion, the reproducer hinged to said carriage and having its stylus resting on the sound-record when the carriage is down upon the guides in operative position, and the support for the reproducer also carried by the carriage and normally out of engagement therewith but so located as to support the reproducer when the carriage is tipped upon its hinge.

Signed by me at New York, N. Y., this 25th day of November, 1899.

LOUIS P. VALIQUET.

Witnesses:

W. H. PUMPHREY,
A. PARKER-SMITH.

E. TREITSCHKE.
PHONOGRAPHIC CLOCK.

(Application filed July 15, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1

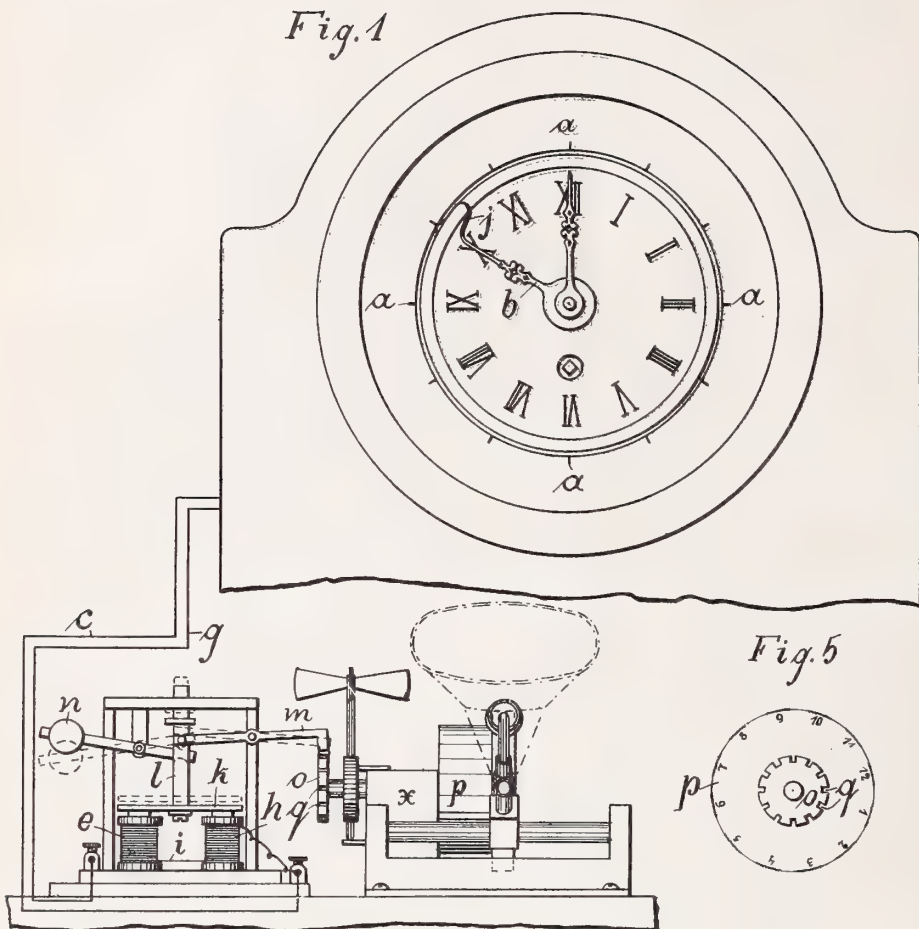
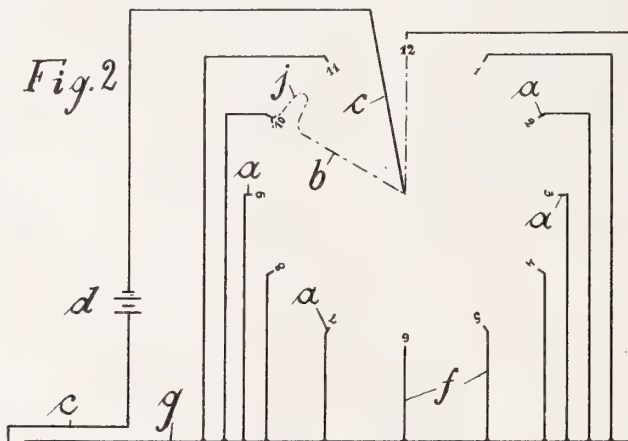


Fig. 5



Fig. 2



Witnesses.
Rosann Smith.
W. H. Reid.

Inventor.
E. Treitschke,
per E. Reichelt, atty

E. TREITSCHKE.
PHONOGRAPHIC CLOCK.

(Application filed July 15, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3

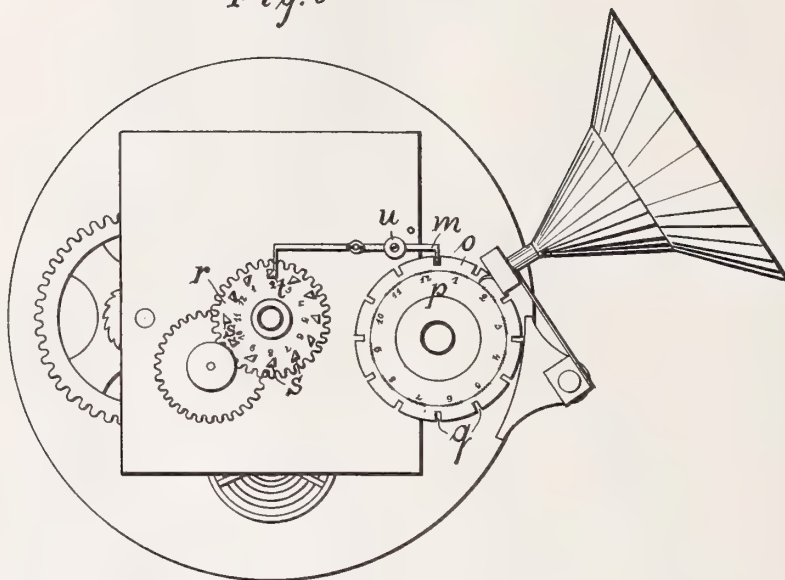
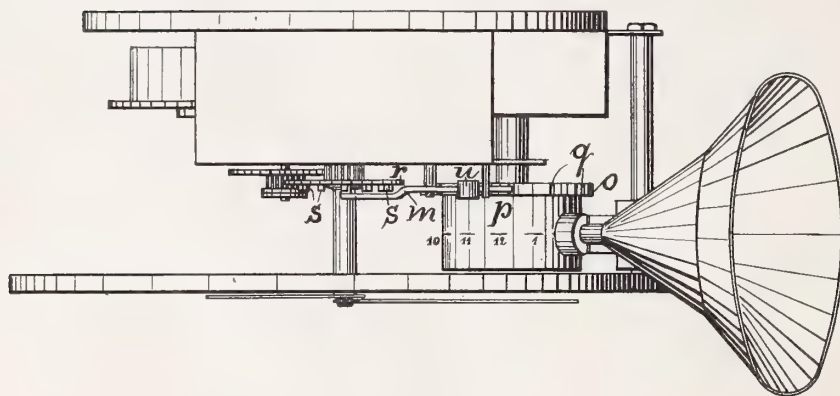


Fig. 4



Witnesses.

Rosann Smith.

W. H. Ried.

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per
G. Reichelt,
att'y.

UNITED STATES PATENT OFFICE.

ERWIN TREITSCHKE, OF DRESDEN-BLASEWITZ, GERMANY.

PHONOGRAPHIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 652,152, dated June 19, 1900.

Application filed July 15, 1899. Serial No. 723,953. (No model.)

To all whom it may concern:

Be it known that I, ERWIN TREITSCHKE, a citizen of the Kingdom of Saxony, residing at Dresden-Blasewitz, in the Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Clocks Combined with a Phonograph or the Like; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

With the great demands to which at the present day people are individually subject if they would compete with their fellows and by reason of the corporeal and mental strain thereby occasioned nervousness has greatly increased, so much so that it may even be observed in children. To such as suffer from nervousness many kinds of noises are very distressing, as the striking of a clock, which to many sufferers seems to sound against the head. Many cannot follow their employment during the time of striking, because of inability to concentrate their thoughts, and often many cannot follow the number of strokes with certainty.

The object of the invention is to provide a clock or time-measurer generally with an arrangement or device for indicating the conclusion of given intervals of time for the benefit of nervous persons in a very gentle as distinguished from a distressing way and without the strokes of the clock sounding in an uncertain manner, as hitherto.

This invention consists in the combination of a clock or other chronometer with a phonograph, graphophone, gramophone, or the like, which speaks out the words at the conclusion of given time intervals—for instance, on the hours and half-hours.

The construction of the invention is shown in the accompanying drawings in two forms.

Figures 1 and 2 are respectively an elevation thereof and a diagram of the conductors for electric working; and Figs. 3 and 4, respectively, an elevation and a plan of the device for purely mechanical working. Fig. 5 is a detail of the roller and notched wheel.

In Figs. 1 and 2 are very light spring-contacts *a*, arranged around the clock-face near the figures, and *b* is the small hand of the

clock, provided with a fine yielding spring *j*, by which it comes into electric communication with the spring-contacts *a*. The hand *b* is connected through a wire *c*, communicating with a source of electricity *d*, with a magnet-bobbin *e*, and likewise the spring-contacts *a* are connected through wires *f* and a main wire *g* with a magnet-bobbin *h*, which is connected with the other bobbin by a conductor *i*. The magnet-armature *k* carries by a rod *l* a pawl *m*, which by the action of a counterweight *n* is adapted to lock a wheel *o* of a phonograph-roller *p*, having on its periphery successive impressions or indentations corresponding to the twelve figures of the clock. The phonograph style can touch into the impressions. The wheel *o* is provided with notches *q*, Fig. 5, corresponding in number to the time intervals to be called out, into which the pawl *m* can fall. At the end of an hour, when the hand *b* comes into electrical communication with one of the spring-contacts *a*, Fig. 1, the pawl *m* is thereby released by reason of the bobbins *e h* attracting the armature *k*, the clockwork *x* of the phonograph sets the roller *p* of the same in rotation, the phonograph speaks out the corresponding number, and this being done the pawl *m* engages in the next notch of the wheel *o* and holds it and the phonograph-roller fixed until the next contact takes place, and so on.

In Figs. 3 and 4 the arrangement of the phonograph-roller *p* and the notched wheel *o* is as in the preceding example; but in this case the counterweight *n* is actuated from a wheel *r* of the clock, said wheel being for this purpose furnished with triangular projections *s*, which when the wheel turns engage the bent end *t* of the pawl *m* and press it downward to release the pawl from the wheel *o* at the given time intervals, thus permitting the movement of the phonograph-roller. When in this way the number of the hour has been spoken out, the pawl *m* in this case also falls into the next notch and locks the wheel *o* with the phonograph-roller and its driving mechanism until the lapse of another hour. The counterweight *n* is sufficiently heavy to cause the end of the pawl to drop into the next succeeding notch *q* in the

wheel *o*, and thus there is no danger that the wheel *o* will ever revolve sufficiently far for the end of the lever *m* to skip one of the notches *q*. The moment the current is broken
 5 or interrupted the counterweight *n* instantly raises the rod, and thereby forces the lever *m* forcibly against the periphery of the wheel, and the end of the lever catches in the next succeeding notch without fail.

10 While in the example of Figs. 3 and 4 the calling of the hour is accomplished directly at the clock, in that of the electric working the phonograph for calling out the hours can be located where desired, or several phono-
 15 graphs may be located each in a different place to call out the time from one clock with which they are connected.

In both examples the phonograph-roller may be provided with sounding-lines, for
 20 example, for giving off one or more call or alarm sounds preliminary to the call of the hour.

As in the example of Figs. 1 and 2, the contacts may be removed to different parts of
 25 the clock; so, also, in that of Figs. 3 and 4 may the phonograph-roller be locked from any other suitable part of the clock and also by

other means than projections, such as *s*, without affecting the invention.

Having thus fully described my invention, 30
 I claim and desire to secure by Letters Patent—

In a phonograph-clock, the magnets, the armature, the vertical rod secured to and
 35 connected at its inner end to the vertically-moving rod, and the pivoted lever also having its inner end connected to the rod, combined with a phonographic cylinder provided with a toothed wheel upon one end, with
 40 which the said pivoted lever engages; the clock, one of the hands of which is provided with a suitably-shaped end for passing over the contact-points arranged around the dial, and the contact-points, suitable wires extend-
 45 ing therefrom connecting with the battery, and the magnets, substantially as shown.

In testimony whereof I affix my signature in presence of two witnesses.

ERWIN TREITSCHKE.

Witnesses:

EMIL REICHELT,
 HERNANDO DE SOTO.

No. 652,457.

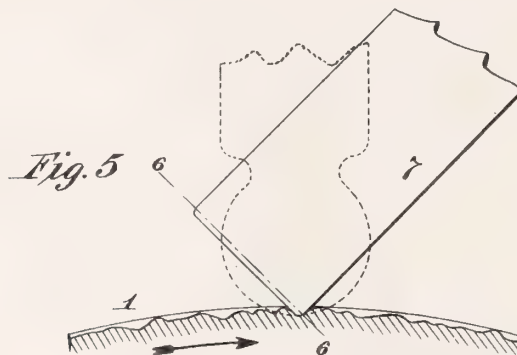
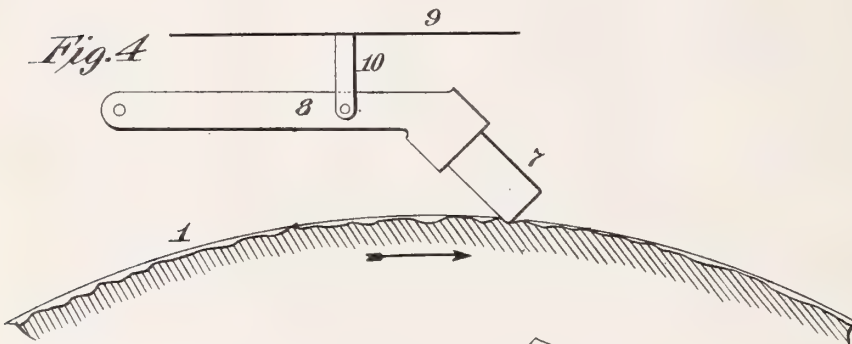
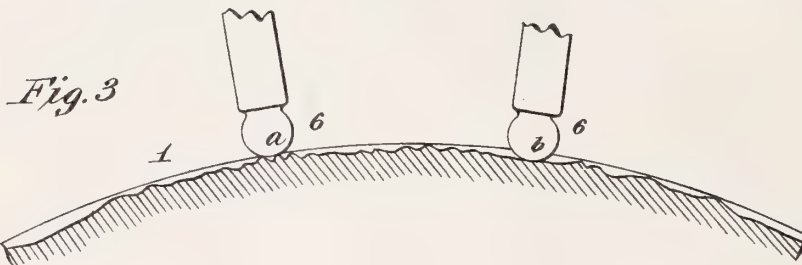
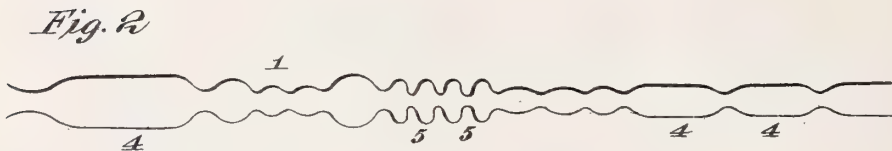
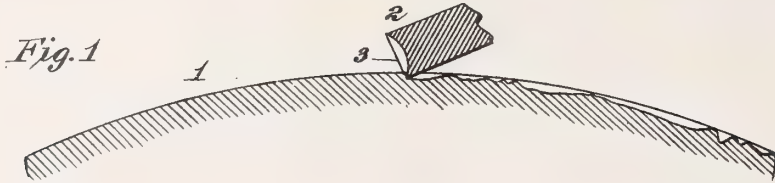
Patented June 26, 1900.

T. A. EDISON.
PHONOGRAPH.

(Application filed Sept. 21, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:

Jas. F. Coleman
Geo. R. Taylor,

Inventor

Thomas A. Edison

by *Hyman Edmund Rogers*

Att'ys.

T. A. EDISON.
PHONOGRAPH.

(Application filed Sept. 21, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 6

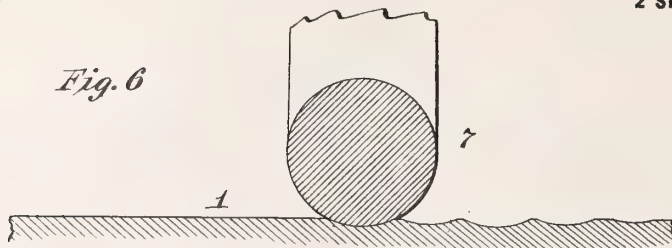


Fig. 7

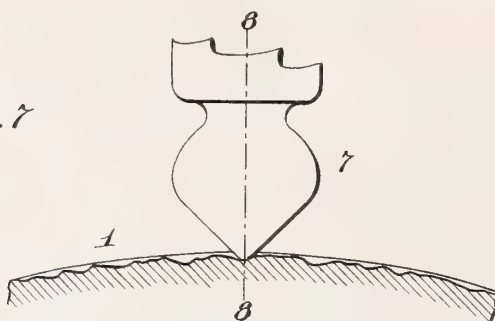


Fig. 8

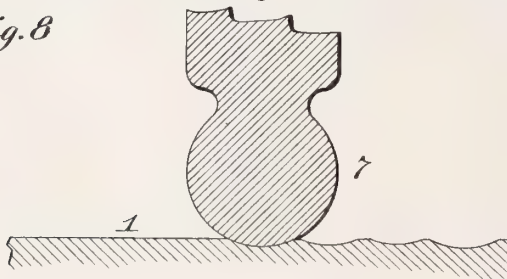


Fig. 9

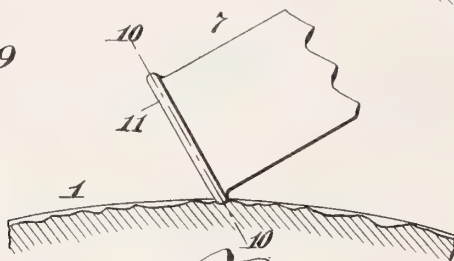
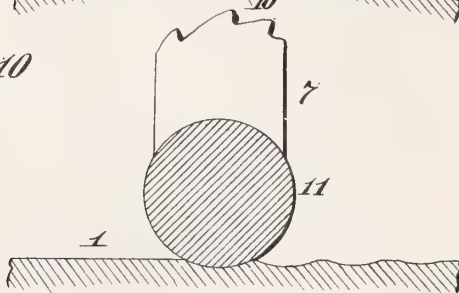


Fig. 10



Witnesses:

John F. Coleman
John R. Taylor

Inventor

Thomas A. Edison

By *Edwards & Ayer*

Att'ys.

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 652,457, dated June 26, 1900.

Application filed September 21, 1899. Serial No. 731,138. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, a citizen of the United States, residing at Llewellyn Park, in the county of Essex and State of New Jersey, have invented a certain new and useful Improvement in Phonographs, (Case No. 1,014,) of which the following is a specification.

My invention relates to improvements in phonographs; and my object is to produce a phonograph wherein the loudness and quality of the reproduction will be increased.

Experience has demonstrated the superiority of the type of recorder described in my Patent No. 430,278, dated June 17, 1890, by which will be obtained a record composed of a series of more or less connected gouges of varying dimensions, all of less depth than width and presenting in cross-section at any point an arc depending in extent upon the depth of cut of the recorder. A record of this character offers a large bearing-surface for the customary spherical reproducing device and causes the latter to track automatically. It is well known that the imperfections in phonographic reproductions are due in part to the fact that the spherical reproducer is not allowed to engage all the portions of the record representing fundamental tones and principal overtones, because some of the waves or gouges thereof are of less length than width. By my present improvement I overcome this objection and obtain a reproducer for use in reproducing from records of the character described and which will automatically track the record-groove and engage all portions thereof representing fundamental tones and overtones even when the waves or depressions are greater in width than in length. In this way I am enabled to obtain better reproductions without the necessity of increasing the peripheral speed of the recording-surface. It is obvious that in the operation of the phonograph the formation of such representative waves or depressions having a greater width than length can be avoided by increasing the peripheral speed of the recording-surface and that when the waves are thus always characterized a spherical reproducer can be effectively used; but the increase in speed is objectionable, because the increased pressure imposed on the recording device prevents the latter from responding

as sensitively to the sound-vibrations as when a lower speed is employed, and hence even the principal overtones will be in part at least omitted or imperfectly recorded. By means of my present improvement I effect a perfect tracking of the record not by changing or distorting the record, but by the employment of a reproducer of such a form that it will enter all portions of the record as at present made at the usual surface speeds and which are more nearly graphically representative of the original sounds than are records made at abnormally-high surface speeds.

To this end my invention consists in employing, in combination with a record-groove of the character described, a reproducer presenting in cross-section to the record a curved form not greater than the curve of the cutting edge of the recorder and preferably of a slightly-less radius than that curve, and which presents longitudinally of the record a bearing-surface rounded to prevent wear and of a materially-less radius than is presented to the record by the ordinary spherical reproducer. Preferably the specific form of reproducer which I employ is a cylinder inclined to the tangent of a cylindrical phonogram or to the record-surface of a flat phonogram, the bottom edge of the cylinder engaging the groove and said edge being provided with a rounded bead or projecting rib which engages the record.

In order that my invention may be better understood, attention is directed to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a sectional view, taken lengthwise of the record-groove, illustrating the manner of forming the record by means of a recorder of the type described in my said patent, the parts being enlarged for the purpose of clearness; Fig. 2, a plan view, on an enlarged scale, of a record-groove produced by a recorder having a curved cutting edge; Fig. 3, a diagram showing in longitudinal section, on an enlarged scale, a portion of a record-groove, at *a* a spherical reproducer engaging with a record-wave of less length than width, and at *b* a spherical reproducer engaging with a record-wave of greater length than width; Fig. 4, a section longitudinally through the record, on an enlarged scale,

showing one form of the improved reproducer engaging with a record-wave of less length than width; Fig. 5, an enlarged section taken longitudinally of the record, showing the improved reproducing device placed in the opposite direction from that shown in Fig. 4 and illustrating in dotted lines the usual spherical reproducing device, whereby a comparison of the two reproducers can be conveniently made; Fig. 6, a section on the line 6 6 of Fig. 5; Fig. 7, a side elevation of the preferred form of the improved reproducer, and Fig. 8 a section on the line 10 10 of Fig. 7.

In all of the above views corresponding parts are represented by the same numerals and letters of reference.

1 represents a phonogram-blank, which is preferably cylindrical in form, of a soap-like composition, as is now common. Flat phonograms may be employed, and other materials may be used.

2 represents the recorder of the type described in my said Patent No. 430,278, said recorder having a curved cutting edge 3 and being preferably hollowed out to facilitate the gouging or cutting of the records. With such a device the record will partake generally of the appearance shown in Fig. 2, being composed of a series of more or less connected gouges of varying dimensions, according to the amplitude or extent of movement of the recording-diaphragm and to the rapidity of vibration thereof. Owing to the relatively-great diameter of the recording edge to the depth of cut, all the depressions of which the record is formed are characterized by a greater width than depth. Some of these waves—as, for instance, 4 4—are greater in length than width, but others, such as 5 5, are found in practice to be of less length than width. The effect of an attempt to reproduce these records with a spherical reproducer is shown clearly in Fig. 3, wherein two spherical reproducing-balls 6 6 are illustrated. In the case of the waves which are of greater length than width the reproducer, as at *b*, will be free to engage the entire length of the wave; but when the length of the wave is less than its width the spherical reproducer, as shown at *a*, will not be allowed to enter the record-groove, but will be arrested by the crests of the adjacent waves. The reproducer in the latter case, therefore, does not accurately track the record and the reproducer-diaphragm is not vibrated in accordance with the record.

Referring to Fig. 4, 7 represents one form of the improved reproducer, which may be connected directly to the diaphragm or to a lever 8, which is connected to the diaphragm 9 by a link 10. The reproducer is preferably cylindrical in form, with its lower edge resting in the groove, the axis of the cylinder being preferably inclined at an angle of about forty-five degrees from the tangent of a cylindrical record or from the face of a flat record. The reproducer may be inclined in the direction of movement of the blank, as shown in Fig. 4,

or against the movement of the record, as shown in Fig. 5. The curve of the engaging edge of the reproducer, as shown in Fig. 6, is not more than the curve of the cutting edge 3 of the recording device, and it is preferably slightly less than that curve, so that the reproducer can always be free to track accurately in the groove. The curve presented by the engaging edge of the reproducer longitudinally of the wave, as shown in Fig. 5, is very much less than is presented by a spherical reproducer, as may be seen from an examination of this figure. Hence a depression or wave which could not possibly be engaged by a spherical reproducer can be accurately tracked by my improved reproducer. At the same time the bearing-surface of the reproducing device is almost as great as that which is presented by a spherical reproducer, so that there will not be any excessive wear. By employing a reproducing device of this general character which will present lengthwise to the wave a very much less surface than is the case with the spherical reproducer I am enabled to accurately track a record even when certain of the waves, or all of them, representative of fundamental tones and principle overtones are materially less in length than in width, and therefore do away with the necessity of preventing the occurrence of such waves by operating the phonogram at an abnormally-high speed. It will be understood that instead of using a reproducer which is cylindrical in form any other form of reproducer may be employed presenting a curved surface to the record and with its longitudinal dimension contracted sufficiently to allow it to enter to the full depth in the record-groove even when the waves are very short and deep.

The preferred form of the reproducer is shown in Figs. 7 and 8, wherein the reproducer consists, generally, of a cylindrical shank having a rim 11 at its bottom edge, the curve presented by such rim at right angles to the record being shown in Fig. 8, while the curve which is presented by such rim longitudinally of the record is shown in Fig. 7. It is evident that this form of reproducer can be placed at a less inclination to the record than the form shown in Figs. 4 and 5, and I prefer to support it at no greater inclination to the record than is necessary to enable its holder to clear the record-surface. In all forms of the reproducer which have been illustrated the bearing-surface has a radius which is very much smaller longitudinally of the record than crosswise thereof, and this bearing-surface is one having the same width throughout its length, the length of the bearing-surface being at right angles to the length of the record-groove. The width of the bearing-surface may be reduced to the minimum when the recording-surface is made of a material which is sufficiently hard to withstand the scraping action of such a bearing-surface; but with softer recording materials the width of the bearing-surface of my improved re-

producer should be increased to produce the requisite life of the record. I have found, however, that with recording-surfaces made of the soap compositions now commonly used for the cylinders of the phonograph the proportions of width to length shown in the drawings can be employed without excessive wear of the record.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is as follows:

1. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves representative of fundamental tones and principal overtones being characterized by a greater width than length, of a reproducing device having a curved bearing-surface engaging the bottom and side walls of the record and of a form adapted to enter and accurately track all of such representative waves, substantially as and for the purposes set forth.

2. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves representative of fundamental tones and principal overtones being characterized by a greater width than length, of a reproducing device having a curved bearing-surface which engages the record-groove and reduced in its longitudinal dimension, whereby the reproducing-surface may accurately track a wave having a less length than width, substantially as set forth.

3. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of the waves representative of fundamental tones and principal overtones being characterized by a greater width than length and said waves differing from each other in the slope of their decending and ascending walls, of a reproducing device having a curved bearing-surface engaging the sides and bottom of the record and of a form adapted to enter and accurately track all of such representative waves, substantially as and for the purposes set forth.

4. In a phonograph, the combination with a phonogram having a record thereon formed of

a series of more or less connected gouges or waves with rounded sides and bottom, some of the waves representative of fundamental tones and principal overtones being characterized by a greater width than length, of a reproducing device having a curved bearing-surface engaging the sides and bottom of the record to accurately track all of such representative waves, said reproducing device being of such a form as not to engage simultaneously the descending and ascending slopes of the waves, substantially as set forth.

5. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves being characterized by a greater width than length, of a cylindrical reproducing device placed at an angle to the record and with its lower edge engaging the sides and bottom of the record, substantially as set forth.

6. In a phonograph, the combination with a phonogram having a record thereon formed of a series of more or less connected gouges or waves with rounded sides and bottom, some of said waves being characterized by a greater width than length, of a cylindrical reproducing device having a rounded bottom edge which engages the sides and bottom of the record, substantially as set forth.

7. As a new article of manufacture, an improved reproducer for phonographs, having a curved engaging edge, said edge being curved longitudinally of the record in a smaller radius than at right angles thereto, substantially as set forth.

8. As a new article of manufacture, a cylindrical reproducer maintained in an inclined position and having its bottom edge rounded for engagement with the record, substantially as set forth.

9. An improved phonograph-reproducer, consisting of a cylinder having at one end a rounded bead or rib, projecting beyond the periphery of the cylinder, which rib forms the bearing-surface of the reproducer, substantially as set forth.

This specification signed and witnessed this 12th day of September, 1899.

THOMAS A. EDISON.

Witnesses:

J. F. RANDOLPH,
EDWIN E. HAGERTY.

No. 652,710.

Patented June 26, 1900.

F. W. BAYNES.

PHONOGRAPH.

(Application filed Feb. 16, 1899.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

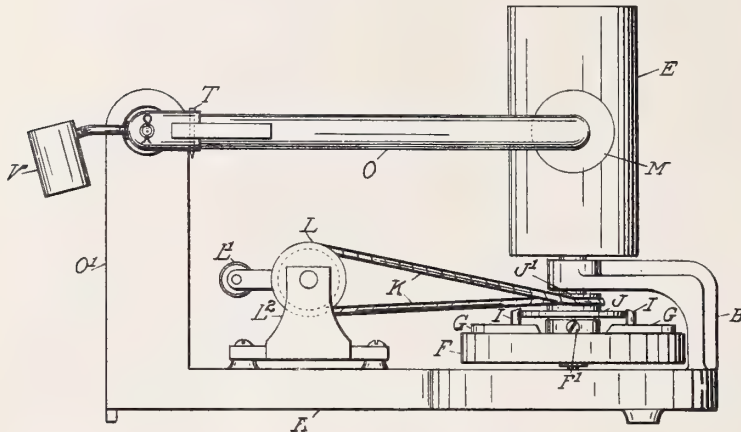
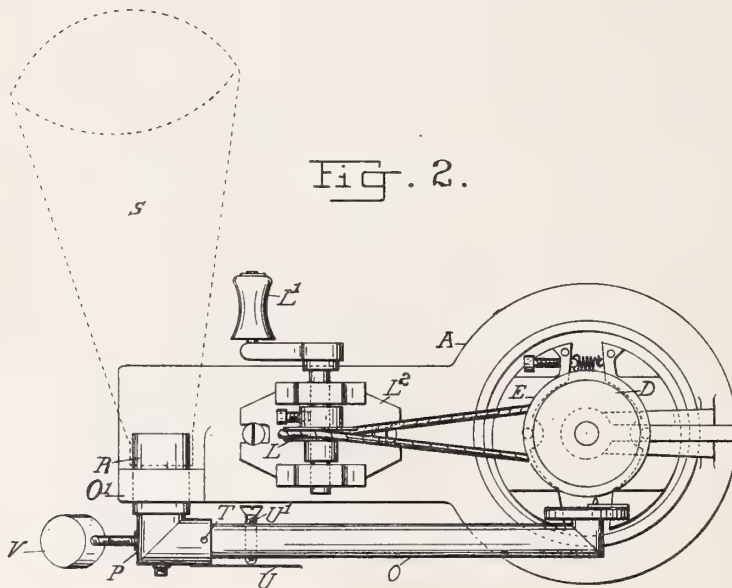


Fig. 2.



WITNESSES

R. O. Lowhagen

J. Wyeth.

INVENTOR

Fredrick Walter Baynes

By R. S. Caldwell.
Atty.

No. 652,710.

F. W. BAYNES.
PHONOGRAPH.

Patented June 26, 1900.

(Application filed Feb. 16, 1899.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 3.

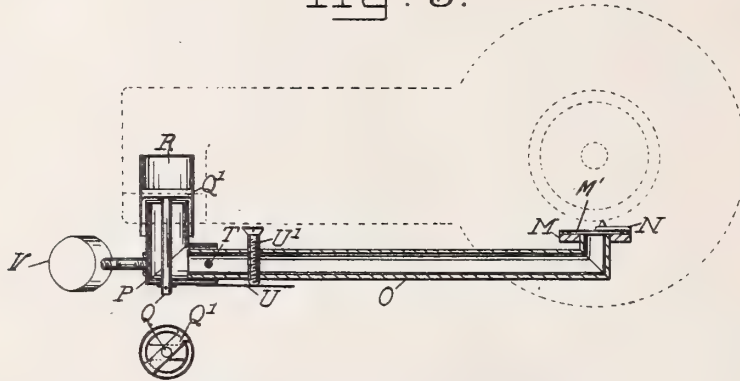


Fig. 4.

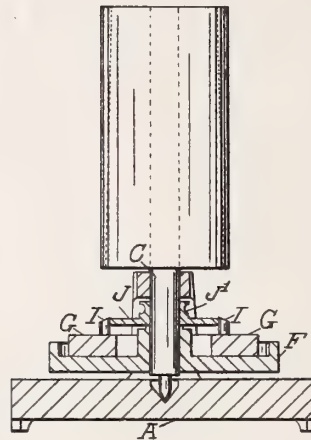
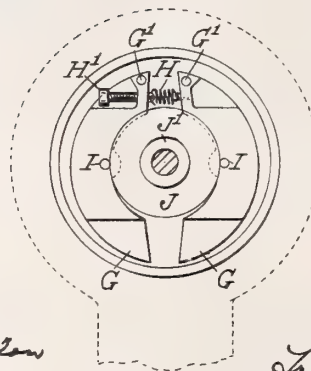


Fig. 5.



WITNESSES

W. O. Rinderson
J. Wyeth

INVENTOR

Fredrick Walter Baynes
by R. J. Caldwell, atty.

UNITED STATES PATENT OFFICE.

FREDERICK WALTER BAYNES, OF LONDON, ENGLAND.

PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 652,710, dated June 26, 1900.

Application filed February 16, 1899. Serial No. 705,605. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK WALTER BAYNES, a subject of the Queen of Great Britain and Ireland, and a resident of 93 Umfreville road, Harringay Park, London, England, have invented certain new and useful Improvements in Phonographs, Gramophones, and the Like; and I hereby declare that the following is a full, clear, and exact description of the same.

My invention relates more especially to an apparatus for reproducing voice and other sounds.

It consists of the novel construction and arrangement of the various parts, whereby a simple and effective machine can be produced.

The invention will be better understood upon reference to the accompanying drawings, in which—

Figure 1 is a side elevation of the apparatus. Fig. 2 is a plan of the same. Fig. 3 is a section of the hollow turnable arm which carries the sound-box. Fig. 4 shows a section of the speed-regulating gear with the record-cylinder in position; and Fig. 5 shows a plan of the same, but with the record-cylinder and its holder removed.

In carrying out my invention I form a suitably-shaped frame A, having at one end a bracket B to support vertically the spindle C of the holder D for the record-cylinder E. The said holder is firmly secured to that part of the spindle C extending above the bracket, so that the record-cylinder can be placed on the holder or removed therefrom with little trouble. Said spindle is pointed at its lower end and takes its bearing upon the base-plate of the frame A in such a manner as to minimize friction as far as possible. A fly-wheel F is affixed by means of a set-screw F' to the spindle C and carries two movable weights G and G', which are pivoted thereto at G' and G'. The said weights are drawn toward each other by a spring H, the tension of which can be regulated by a screw H'. Pins I and I', preferably of ebonite, are fixed to the weights G and G' for the purpose of engaging the periphery of the disk J, formed on the pulley J' and loosely arranged upon the spindle C. The said pins on the weights in their normal position grip the disk J, so

that when the pulley is revolved motion is imparted to the spindle C and holder D. So long as the speed of the said holder is normal the pins will remain in contact with the disk; but should the holder attain a greater speed than is required for the proper working of the machine the weights G and G' will open out farther at their free ends by the centrifugal force set up and so cause the pins I and I' to release the disk J, thus breaking the connection with the driving power until the proper momentum is restored. This form of connection between the driving and driven parts, moreover, insures a regular movement to the holder independently of the driving parts.

The disk J is revolved by means of an endless belt K, which is arranged upon the pulley J', before mentioned, and a pulley L, connected with the turning-handle L'. The said pulley and handle are fixed upon a spindle carried by the adjustable bracket L².

The record-cylinders that I use with my apparatus may be formed of any suitable substance; but I prefer them of prepared wax made in the ordinary manner. In the exterior of the cylinder is formed a fine spiral groove from one end to the other. In this groove the impressions of the sound-waves are formed by any suitable recording sound-box carried on the arm O.

When a record-cylinder, placed on the holder, is revolved at a suitable speed, the impressions thereon are transformed into sounds by means of a reproducing sound-box carried on the free end of a light movable tubular arm O and here shown as of the usual type, consisting of the case M, diaphragm M', and stylus N. This arm is mounted on a standard O', so as to pivotally swing in a vertical plane and carry the stylus through an arc of contact with the cylinder nearly approaching the vertical. The said arm is furnished with an elbow-piece P, which is pivoted on a spindle Q, projecting from a cross-bar Q', made rigid in the tube R, to which the resonator or trumpet S (shown in dotted lines in Fig. 2) or a suitable device for conveying the sounds to the ear is attached. The arm O is loosely connected to the said elbow-piece by a pin T in such a manner as to be capable of a

slight lateral movement. It is, however, forced inward by a spring U, projected from and carried by the elbow-piece P, the tension of the said spring being regulated by a screw U', so that the stylus will bear against the record-cylinder at a suitable uniform pressure. A weight V is secured to the elbow-piece P in such a position as to counterbalance the arm O, and thus make said arm very sensitive to the influence of the spiral groove of the cylinder, so that the arm may be freely moved thereby from one end of the cylinder to the other with very little resistance. The same result may, however, be obtained by the employment of a delicate spring fastened at one end to a fixed support near the pivot and the other end engaging with the said arm.

To use the apparatus, it is only necessary to place a cylinder bearing the record upon the holder D, then lower the arm to the starting position if the record begins at the bottom of the cylinder, as is assumed in the drawings, arrange the resonator to intensify the sounds, or suitable flexible tubes to convey them direct to the ears upon the tube R, and turn the handle L' at a suitable speed, when the desired result will be obtained.

It is understood that the term "sound-box" is generally known in the art to indicate any sound-sensitive instrument, whether used as a recorder or reproducer, and it is so intended as used in the specification and claims of this application without limiting the meaning to any particular type, for it is obvious that the spirit of my invention does not reside in this feature; but it is equally well adapted for use with most any other type of sound recording or reproducing instrument, whether employing box, diaphragm, and stylus or not.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a device of the character described, a suitably-journaled record-cylinder, an angular tube pivotally mounted, a hollow spring-pressed arm pivoted to the tube, and a sound-box carried by the arm to travel over the surface of the cylinder, substantially as described.

2. In a device of the character described, a suitably-journaled record-cylinder, a swinging arm comprising two members with an adjustable resilient connection therebetween, and a sound-box carried by the arm to travel over the surface of the cylinder, substantially as described.

3. In a device of the character described, a suitably-journaled record-cylinder, in combination with a swinging arm comprising two members pivoted together, a spring projecting from one member, a set-screw threaded through the other member and bearing on the spring, and a sound-box carried by one of the said members to travel over the sur-

face of the cylinder, substantially as described.

4. In a device of the character described, a suitably-journaled record-cylinder, in combination with a swinging tubular arm comprising an angular member having one arm pivotally mounted on an axis in a plane at right angles to the axis of the cylinder, a second member pivoted to the other arm of the angular member on an axis in a plane at right angles to the pivotal axis of said angular member, a resilient connection between the two members, and a sound-box carried by one of said members to travel over the surface of the cylinder, substantially as described.

5. In a device of the character described, a suitably-journaled record-cylinder, a stationary tube, a spindle axially disposed within the tube in a plane at right angles to the axis of the cylinder, a swinging tubular arm comprising an angular member with one arm thereof telescoped within the tube and journaled on the spindle, a second member telescoped within and pivoted to the other arm of the angular member in a plane at right angles to the spindle, a spring projecting from the angular member, a screw threaded in the second-named member and bearing on said spring, a weight connected to the angular member, and a sound-box carried by the second-named member to travel over the surface of the cylinder, substantially as described.

6. In a device of the character described, a suitably-shaped frame, an angular bracket projecting therefrom, a vertical spindle journaled in the bracket and frame, a fly-wheel rigidly secured to the spindle between the bracket and frame, spring-pressed weights pivoted to the fly-wheel, a pulley having a friction-disk loosely mounted on the spindle, pins projecting from the weights to normally engage the friction-disk, means for imparting motion to the pulley, a record-cylinder secured on the free upper end of the spindle, a standard on the frame, a spring-pressed arm pivotally attached to the standard to swing in a vertical plane, and a sound-box carried by the arm to travel over the surface of the cylinder, substantially as described.

7. In a device of the character described, a suitably-journaled record-cylinder, in combination with a swinging arm comprising two members pivoted together, a spring projecting from one member and bearing on the other member, and a sound-box carried by one of the said members to travel over the surface of the cylinder, substantially as described.

8. In a device of the character described, a tube, a spindle arranged axially therein, an elbow telescoped with the tube and journaled on the spindle, and an arm pivoted to the elbow, substantially as described.

9. In a device of the character described, a tube, a spindle arranged axially therein, an

5 elbow with one end telescoped with the tube and journaled on the spindle, an arm telescoped with the other end of the elbow and pivoted thereto on an axis in a plane at right angles to the spindle, a screw threaded in the arm, and a spring on the elbow bearing on the screw, substantially as described.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

FREDERICK WALTER BAYNES.

Witnesses:

W. D. ROWLINGSON,
J. WYETH.

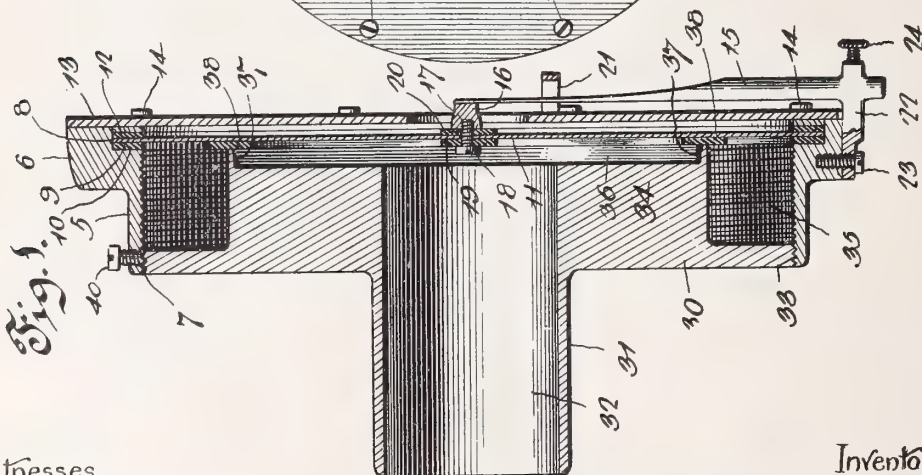
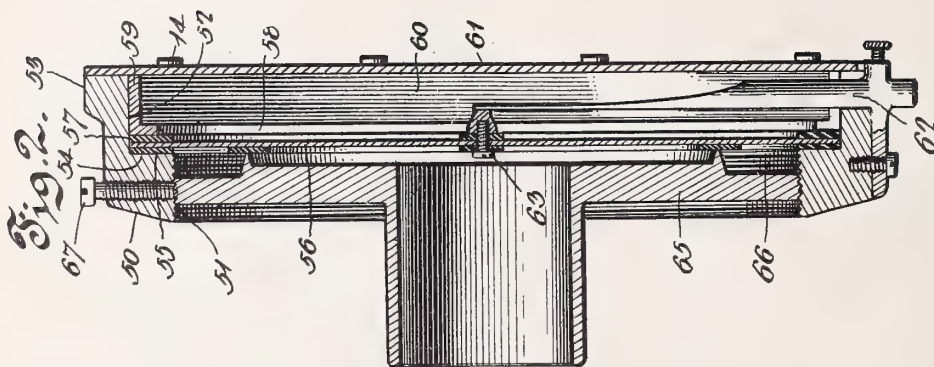
No. 652,800.

Patented July 3, 1900.

H. S. MONTGOMERY.
GRAMOPHONE SOUND BOX.

(Application filed Aug. 15, 1899.)

(No Model.)



Witnesses,

J. Frankfurterwell.
Georg. Chaudet.

Inventor:

By his Attorneys **H. S. Montgomery,**

C. A. Snow & Co.

UNITED STATES PATENT OFFICE.

HENRY S. MONTGOMERY, OF TOPEKA, KANSAS.

GRAMOPHONE SOUND-BOX.

SPECIFICATION forming part of Letters Patent No. 652,800, dated July 3, 1900.

Application filed August 15, 1899. Serial No. 727,316. (No model.)

To all whom it may concern:

Be it known that I, HENRY S. MONTGOMERY, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented a new and useful Sound-Box for Gramophones, of which the following is a specification.

This invention relates to sound-boxes in general, and more particularly to that class employed in connection with the reproducing-diaphragms of gramophones, although the structure and principles involved may be employed in connection with sound-producing diaphragms used in other connections.

One object of the invention is to provide a construction in which the vibrations of great frequency will be absorbed or eliminated to remove the objectionable squeaks and similar foreign sounds and also to utilize the effective energy of a diaphragm of large diameter which under ordinary circumstances has not sufficient rapidity of vibration to produce the proper sound.

A further object of the invention is to provide a construction that will be more durable than that usually employed and in which the delicate parts may be entirely inclosed.

Further objects of the invention will be evident from the following disclosure.

In the drawings forming a portion of the specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a central section taken longitudinally of the stem and diametrically of the diaphragm, the stylus-carrying arm being shown in elevation. Fig. 2 is a section similar to Fig. 1 and showing a modification of interior structure and the employment of a cap or cover to inclose the stylus-arm. Fig. 3 is a top plan view of Fig. 1.

Referring now to the drawings, and more particularly to Figs. 1 and 3, 5 represents a cylindrical sound-box, at one end of which is formed an annular and radial flange 6. The interior of the box 5 is provided with threads 7 for a portion of its length, said threads terminating at the lower edge of an annular groove 8, formed at one end of the box and in the flange 6, this groove being, in effect, a widened bore of the box and having a side wall 9.

Against the wall 9 is placed an elastic gas-

ket 10, of rubber or other suitable material, against which is disposed a diaphragm 11, preferably of mica. Upon the diaphragm and directly above the gasket 10 is a second and similar gasket 12, upon which and the adjacent end of the box is disposed a disk-shaped plate 13, held in place by means of screws 14, passed therethrough and into the end face of the flange 6, the thickness of the gasket 12 being such that it will be compressed by the plate 13 when the latter is screwed into place.

A stylus-carrying arm 15 has a block 16 fixed to the under side of its inner end, and which block is provided with a perforation 17, having threads for engagement by a screw 18, passed upwardly and through a central perforation in the diaphragm 11, a rubber washer 19 being disposed at one side of the diaphragm, between it and the head of the screw, while a second and similar washer 20 is disposed between the block 16 and the adjacent side of the diaphragm and encircles the stem of the screw, the stylus-arm being thus held fixedly in place and against displacement due to excessive vibration of the diaphragm.

The inner end of the arm 15 is preferably passed through a guide 21 and is made thinner vertically at its inner end, the outer end of the arm being cylindrical, as shown, and formed integral with a bracket 22, extending at right angles thereto and fixed within a recess in the periphery of the box through the medium of the screws 23, the arm having thus a comparatively-stiff connection with the box. The arm 15 is provided at its outer end with a central perforation for the reception of the stylus, and which need not be shown, the stylus being held in place by means of a set-screw 24, as is usual.

Engaging the threads 7 upon the inner wall of the box is a plug 30, having a central stem 31, through which and the plug is formed the usual sound-passage 32. That portion of the plug 30 engaging the threads 7 is in the form of a flange 33 at the outer end of the diminished portion 34, this diminished portion being separated from the inner face of the box through the medium of an interspace or chamber 35. The inner end of the diminished portion 34 is provided with a concentric and circular recess 36, resulting in the formation

of a flange 37, forming a continuation of the periphery of the portion 34. This flange 37 bears directly upon the elastic gasket 38, disposed against the lower face of the diaphragm.

5 The result of this construction is that upon the movement of the stylus-arm the diaphragm 11 will be vibrated and that it will not only vibrate in its entirety, but will break up into two parts or sections, one of which
10 will have the recess 36 as a resonator, while the other portion, lying between the flange 37 and the inner wall of the box, will have the chamber 35 as its resonator. The recess 36 is extremely shallow, and thus the volume of air therein does not absorb the vibrations of the central portion of the diaphragm, but instead transmits its vibrations through the sound passage or tube 32. On the other hand, the great depth of the chamber 35 contains a volume of air that absorbs the high and weak tones. Moreover, the gasket 38 tends normally to limit the effective vibration of the diaphragm to that part inclosed thereby, while under excessive conditions the yielding of the gasket permits the diaphragm to vibrate in its entirety, and thus to give forth a greater volume than would be possible with a diaphragm of small diameter. Moreover, it is found that the shrill and metallic sounds and whistling noises are entirely eliminated. In order to hold the plug at the proper point of its adjustment to maintain proper tension of the diaphragm, a set-screw 40 is passed through a threaded perforation
35 in the wall of the box and engages the periphery of the flanged portion 33 of the plug.

Referring now to Fig. 2 of the drawings, in this construction a box 50 is employed, the interior of which is threaded, as shown at
40 51, at one end of the box, the opposite end of the box being increased in interior diameter, as shown at 52, and having a flange 53 upon the outer periphery of the adjacent end. This increase in interior diameter results in the formation of a wall 54, against which is placed a gasket 55, which receives the diaphragm 56. Upon this diaphragm is arranged a gasket 57, and within the box and resting upon the gasket 57 is a flange 58 upon the
50 inner periphery of a bushing 59, which extends to the outer end of the box and results in the formation of a chamber 60 above the diaphragm. A cover or closure 61 for this chamber is screwed upon the end of the box
55 and engages the bushing 59 and forces its flange 58 against the gasket 57 to hold the diaphragm in position. In this construction an opening is formed in one wall of the box for the reception of the stylus-arm 62, which
60 is held in place in the manner above described, the inner end of the arm being firmly secured to the diaphragm by means of the screw 63 and which connection is similar in every respect to that shown in Fig. 1. The
65 plug 65 in this construction is similar to the plug 30, with the exception that it is shorter, and the chamber 66 thereof, corresponding

to the chamber 35, has a lesser depth, and, if desired, the depth of this chamber may be made no greater than that of the central recess in the end of the plug. 70

The structure shown in Fig. 2 is provided with a set-screw 67 for the same purpose as that shown in Fig. 1, and from the above description it will be seen that the several objects of the invention have been secured. 75

It will of course be understood that in practice the specific construction shown and described may be varied, that any suitable materials may be employed, and that any desired proportions may be observed without departing from the spirit of the invention. 80

As above mentioned, the inner end of the stylus-carrying arm is reduced in diameter in the direction of vibration of the diaphragm, 85 and, as shown in the drawings, the object of this reduction in diameter being to form a spring, so that the arm will be yieldable with respect to the diaphragm, the result being a more efficient operation of the apparatus. 90

What I claim is—

1. The combination with a sound-box, of a diaphragm therein and fixed thereto at the periphery of the diaphragm, a plug in the box engaging the diaphragm at one side intermediate its center and periphery to establish a node, a separate resonator for each segment of vibration of the diaphragm, said diaphragm being adapted to vibrate in its entirety and in segments, and a stylus operatively connected with the diaphragm at the opposite side from the plug. 95 100

2. The combination with a sound-box, of a diaphragm fixed in the box at the periphery of the diaphragm, a plug in the box, a cushion between the plug and the diaphragm and engaging the diaphragm at one side thereof between its periphery and its center to establish a node, a separate resonator for each segment of vibration of the diaphragm, whereby the diaphragm will vibrate in its entirety and in sections, and a stylus operatively connected with the diaphragm at the opposite side from the plug. 105 110

3. The combination with a sound-box, of a diaphragm therein and fixed thereto, said diaphragm having a yieldable support at one side between its center and its connection with the box, whereby the diaphragm will vibrate in its entirety and in sections, a separate resonator for each section of the diaphragm, and a stylus operatively connected with the diaphragm for vibrating it. 115 120

4. The combination with a sound-box, of a diaphragm having a yieldable connection with the box, a yieldable contact with the diaphragm intermediate said connection and the center of the diaphragm, whereby the diaphragm will vibrate in its entirety and in sections, and a stylus operatively connected with the diaphragm for vibrating it. 125 130

5. The combination with a sound-box, of a diaphragm yieldably connected with the box, a yieldable contact with the diaphragm on a

continuous line concentric with the diaphragm, whereby the diaphragm will vibrate in its entirety and in sections, and a stylus operatively connected with the diaphragm for vibrating it.

6. The combination with a sound-box, of a diaphragm within the box and connected thereto, and a plug adapted for engagement with the box, said plug having a sound-tube, and concentric recesses in the end of the plug resulting in the formation of a flange, said flange lying between the peripheries of the plug proper and the edge of the sound-tube and engaging the diaphragm between its center and its connection with the sound-box, whereby the diaphragm will vibrate in sections.

7. The combination with a sound-box, of a diaphragm within the box and fixed thereto, and a plug, said plug having concentric depressions in its end, said depressions having different depths and resulting in the formation of a flange adapted for engagement with the diaphragm between its center and its connection with the box, whereby the diaphragm will vibrate in its entirety and in sections.

8. The combination with a sound-box having a diaphragm yieldably connected therewith, of a plug for the box having concentric recesses in its end resulting in the formation of a flange, a gasket disposed between the flange and the diaphragm and in contact with both, said gasket engaging the diaphragm between its center and its connection with the box, whereby the diaphragm will vibrate in its entirety and in sections, a sound-tube leading through the plug, and a stylus connected with the diaphragm for operating it.

9. The combination with a sound-box and the diaphragm therein, of a sound-tube in operative relation to the diaphragm, a bushing adapted to hold the diaphragm in place, a

cover for the bushing and diaphragm and engaged with the box, and a stylus-arm connected with the diaphragm and lying between it and the cover.

10. The combination with a sound-box having a diaphragm therein, of an arm adapted to receive a stylus and having rigid connection with the box, and with the diaphragm, said arm having a spring portion intermediate its points of connection and the point of connection of the arm with the box being between the stylus-receiving end and the point of attachment to the diaphragm.

11. The combination with a sound-box having a diaphragm, of a stylus-arm fixed rigidly to the box and to the diaphragm and adapted to receive a stylus, said arm being reduced in diameter in the direction of vibration of the diaphragm to form a spring and the point of connection of the arm with the box being between the stylus-receiving end and the point of attachment to the diaphragm.

12. The combination with a sound-box, of a diaphragm therein, said diaphragm having a support at one side between its center and its connection with the box, whereby the diaphragm will vibrate in its entirety and in sections, and a stylus-arm connected rigidly with the box, said arm being connected with the diaphragm at one side of its connection with the box and having a stylus at the opposite side of its connection with the box, whereby the stylus and diaphragm will be operated, one by the other.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

HENRY S. MONTGOMERY.

Witnesses:

GEO. H. CHANDLEE,

HARRY H. HOLLANDER.

No. 653,654.

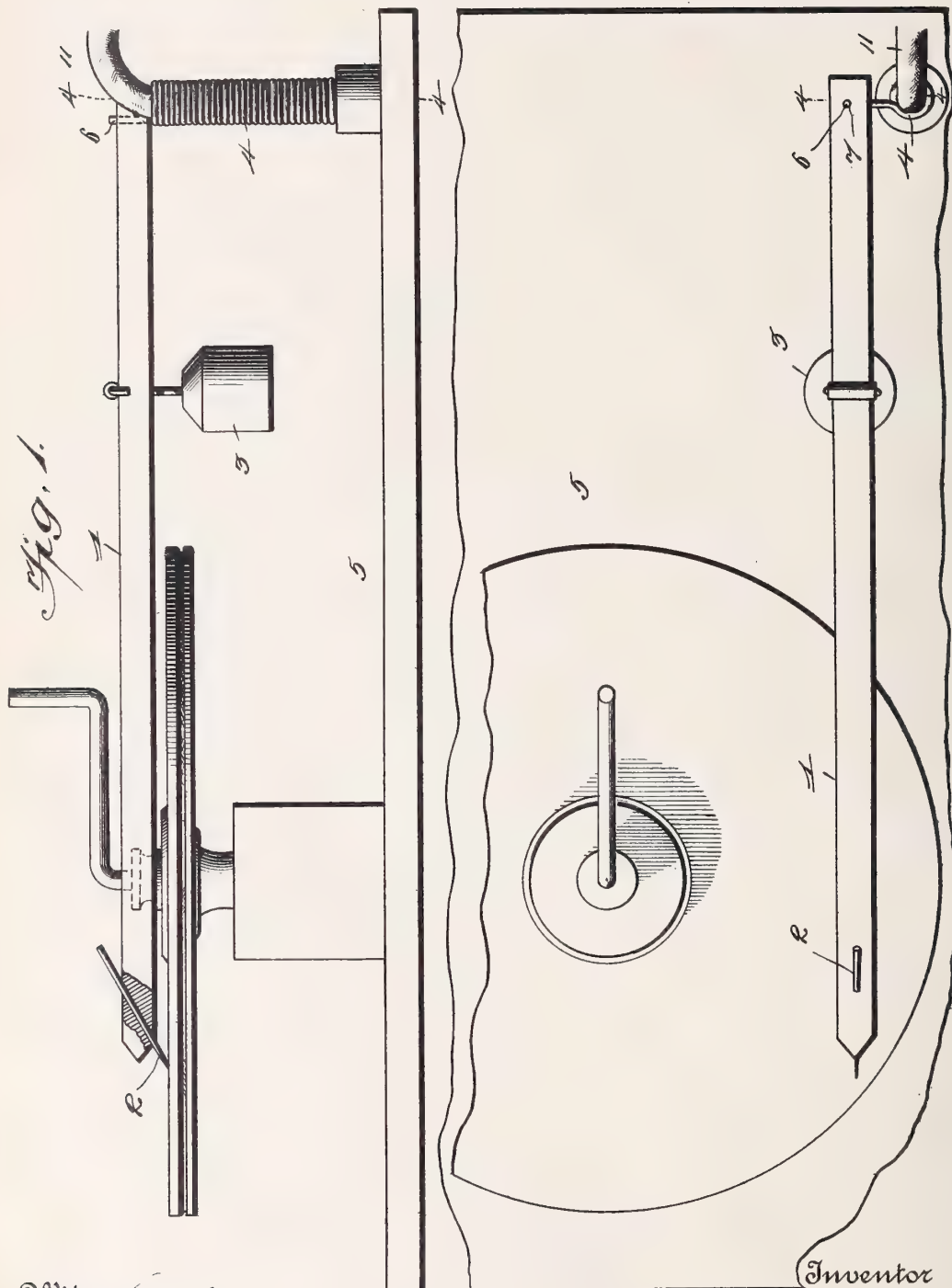
Patented July 17, 1900.

J. N. BROWN.
DEVICE FOR REPRODUCING SOUNDS.

(Application filed Apr. 22, 1897.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses
W. Koerth
Victor J. Evans

Inventor
Joseph N. Brown
By *John Wedderburn*
Attorney

No. 653,654.

Patented July 17, 1900.

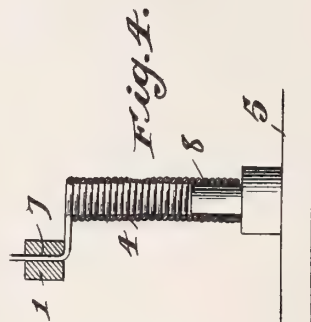
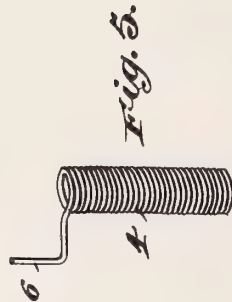
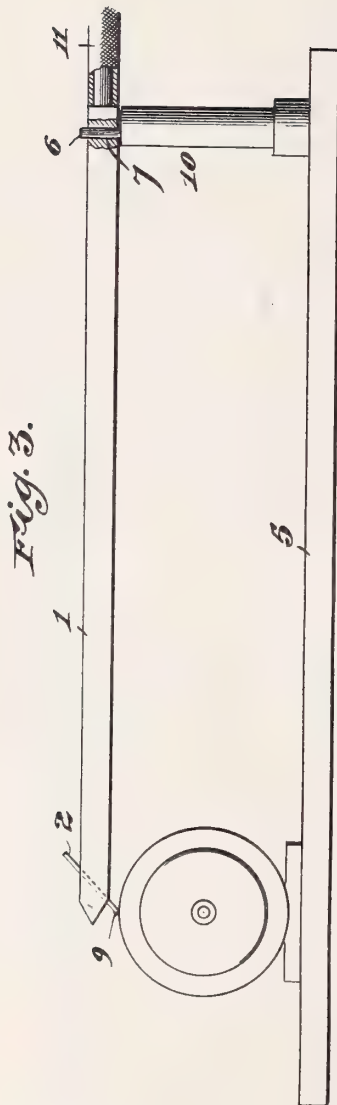
J. N. BROWN.

DEVICE FOR REPRODUCING SOUNDS.

(Application filed Apr. 22, 1897.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses,
J. S. Mann,
Frederick Goodwin

Inventor,
Joseph N. Brown,
By *Offield, Dowle & Linticum,*
Attys.

UNITED STATES PATENT OFFICE.

JOSEPH N. BROWN, OF MUSKEGON, MICHIGAN:

DEVICE FOR REPRODUCING SOUNDS.

SPECIFICATION forming part of Letters Patent No. 653,654, dated July 17, 1900.

Application filed April 22, 1897. Serial No. 633,340. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH N. BROWN, a citizen of the United States, residing at Muskegon, in the county of Muskegon and State of Michigan, have invented certain new and useful Improvements in Devices for Reproducing Sounds; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has reference to a novel construction in a device for reproducing the sounds of a phonogram-record.

The invention consists in the features of construction hereinafter described and specifically claimed.

In the accompanying drawings, forming part of this specification, Figure 1 is a side elevation of a sound-reproducing device constructed in accordance with this invention and shown as arranged for reproducing sounds recorded upon a gramophone-disk. Fig. 2 is a top plan view of the same. Fig. 3 is a side elevation of this invention as arranged for reproducing sounds recorded upon a phonograph-cylinder. Fig. 4 is a vertical section taken on the line 4 4 of Figs. 1 and 2. Fig. 5 is a perspective view of the resilient post or support in detail.

I have discovered that the sound-writings of a phonogram can be reproduced as sonorous vibrations by means of a single bar or rod, preferably of wood, that is yieldingly supported and which is provided with a point or projection adapted to travel in the spiral groove or score containing the sound-writings. In constructing a device of this kind I have successfully reproduced sounds, either musical or articulate speech, from the record of a phonogram by the employment of a bar or rod of wood that is yieldingly supported near one end thereof and which is provided at its other end with a pin or projection to travel in the groove containing the sound-writings. I am not prepared to explain the phenomena, nor the manner in which the sounds are reproduced, and therefore will not attempt to specify herein the scientific principles for the reproduction of the sound, but will simply describe the essential features

and the principle of the invention as I have found them in practical use.

It is understood, of course, that the invention is applicable for the reproduction of the sounds recorded upon phonograph-cylinders, gramophone - disks, and other analogous phonogram-records, and in the accompanying drawings the invention is shown in connection with a phonograph-cylinder and a gramophone-disk.

In said drawings I have shown a vibratory member 1, partaking of the shape of a rod or bar. As shown in the drawings, this vibratory member 1 is yieldingly supported near one end thereof, whereby it can move both laterally and vertically, while its other end is provided with a projection or pin 2, that projects below the vibratory member and is conveniently located at an angle thereto, as shown, to effectually prevent the scratching of the sound-writings. Upon the vibratory member 1 is arranged a weight 3, that serves to hold the projection or pin 2 upon the phonogram-record under sufficient tension to produce the most satisfactory results. This weight is adjustable upon the vibratory member between the point at which it is yieldingly supported and the pin or projection 2, whereby the tension with which it is held against the phonogram-record can be regulated.

The device as above constructed, it is found, reproduces the sound without the aid of a horn or ear-tubes, and, as above stated, although I am not prepared to explain the manner in which the sounds are reproduced, yet I have found it to be a fact.

The particular construction in the yielding support for the vibratory member consists of a resilient post 4, comprising a coil-spring that is firmly fastened at its lower end upon the base 5, while its upper end is provided with a finger 6, that extends upward on one side of the post and which passes through an opening 7 in the vibratory member, in which it fits snugly. This resilient post or support, by means of which the vibratory member is yieldingly supported, is provided with a socket to receive a horn or ear-tube, and in the particular construction illustrated this socket of course is formed by the cylindrical body made

by the coil-spring, and since the finger at the upper end thereof extends upwardly on one side of the coil-spring the end of the tube or horn can be easily inserted within the upper
 5 end of the coil-spring. The said coil-spring can be secured firmly in its upright position by forcing its lower end over a boss or projection 8 upon the base 5. The pin or projection near the free end of the vibratory
 10 member is removable, so that it can be replaced when worn or whenever it is desired, and as an inexpensive and simple embodiment the end of the vibratory member is simply provided with an opening in which
 15 the pin or projection is wedged.

In Figs. 1 and 2 the device is shown in connection with a phonogram-disk, while in Fig. 3 it is shown in connection with a phonogram-cylinder. In Fig. 3 I have also shown the pin
 20 or projection 2 as provided at its lower end with a minute roller 9 to come in contact with the phonogram-record and which will of course subject the said record to less wear than if used in connection with the rigid point
 25 or projection, as heretofore described, and shown in Figs. 1 and 2. Further, in Fig. 3 I have shown the post or support for yieldingly supporting the end of the vibratory member as solid, as shown at 10, while it is provided
 30 with a yielding finger 6, upon which the member 1 is mounted. In this construction the end of the vibratory member can be reduced or rounded, so that it can be inserted in the end of the ear-tube 11 or in the horn, as is obvious.
 35

It is understood, of course, that the form of post shown in Figs. 1 and 2 serves to intensify the vibration and to make the sound clearer and of greater volume as compared with the
 40 form of post shown in Fig. 3, although in accordance with the principle involved by this invention I contemplate employing either a solid, a coil-spring, or a resilient post for supporting the vibratory member for the purpose
 45 of reproducing the sounds of a phonogram-record either with or without the aid of an ear-tube or horn, as found most convenient and desirable.

Having thus described my device, what I
 50 claim as new, and desire to secure by Letters Patent, is--

1. A sound-reproducing device, consisting of a vibratory member secured near one end thereof to a resilient post or support comprising a coil-spring, and provided near its other
 55 end with a point or projection adapted to travel over the sound-writings of a phonogram.

2. A sound-reproducing device, consisting
 60 of a vibratory member secured near one end thereof to an upwardly-extending finger at the upper end of a resilient post or support, said post or support consisting of a coil-spring,

and a point or projection adapted to travel over the sound-writings of a phonogram. 65

3. A sound-reproducing device, consisting of a vibratory member secured near one end thereof to a resilient post or support, said post or support consisting of a coil-spring having an upwardly-extending finger situated to one
 70 side thereof and upon which said vibratory member is mounted, and a point or projection near the other end of said vibratory member adapted to travel over the sound-writings of a phonogram. 75

4. In a sound-reproducing device, the combination of a single vibratory bar of resonant material as contradistinguished from a sound-transmitting device, a point or projection at one extremity thereof adapted to travel over
 80 the sound-writings of a phonogram, a support consisting of a coiled upright spring mounted at one end on a base and having its other end deflected and rigidly attached to said bar, and an ear-tube inserted in and leading from the
 85 upper end of the coil.

5. In a sound-reproducing device, the combination of a single vibratory bar of resonant material constituting in itself a sound-reproducing device, a point or projection at one
 90 extremity thereof adapted to travel over the sound-writings of a phonogram, a support consisting of a spring mounted at one end on a base and having its other end rigidly attached to said bar, and an ear-tube. 95

6. In a sound-reproducing device, the combination of a single solid rod or bar of wood provided near its outer end with a point or projection adapted to travel over the sound-writings of a phonogram, said rod or bar constituting in itself alone a sound-reproducing
 100 device as contradistinguished from a sound-transmitting device, and a metal spring rigidly connected with the other end of this rod or bar so as to support it but permit lateral and vertical movements of the end carrying
 105 said point, substantially as described.

7. In a sound-reproducing device, the combination of a single solid resonant rod or bar of wood provided at one end with a point or projection adapted to travel over the sound-writings of a phonogram, said rod or bar constituting in itself alone a sound-reproducing
 110 device as contradistinguished from a sound-transmitting device, and a support resilient within its body and rigidly attached at its extremities to a fixed base and to the rod or bar at the end of the latter remote from said
 115 point or projection, substantially as described.

In testimony whereof I have signed this
 120 specification in the presence of two subscribing witnesses.

JOSEPH N. BROWN.

Witnesses:

L. R. BROWN,

WM. CARPENTER.

No. 653,667.

Patented July 17, 1900.

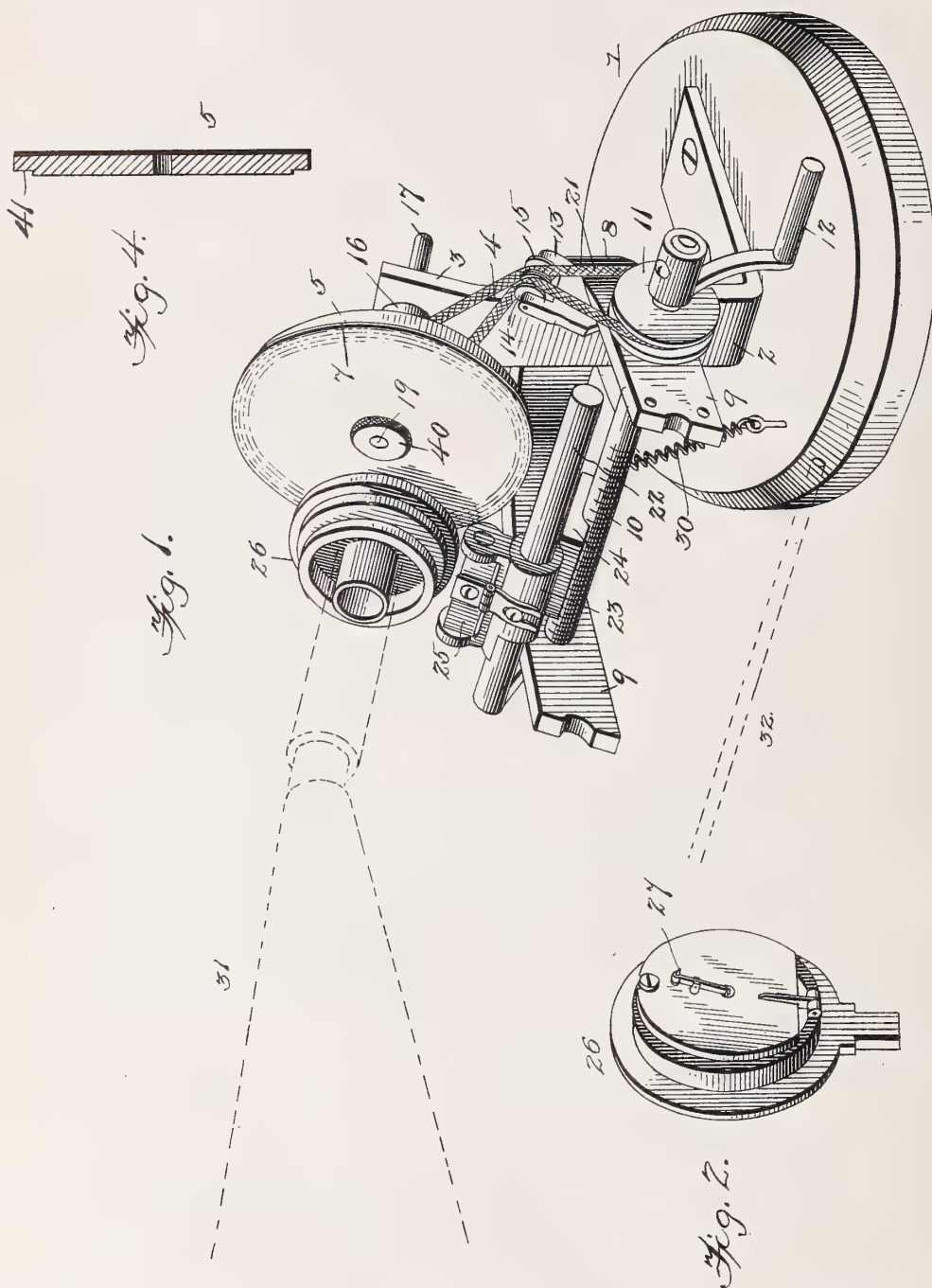
A. C. FERGUSON.

GRAPHOPHONE.

(Application filed Oct. 9, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
T. L. Kocabaer
D. Bradford.

Inventor:
Arthur C Ferguson
By
E Evered Ellis
his Attorney

No. 653,667.

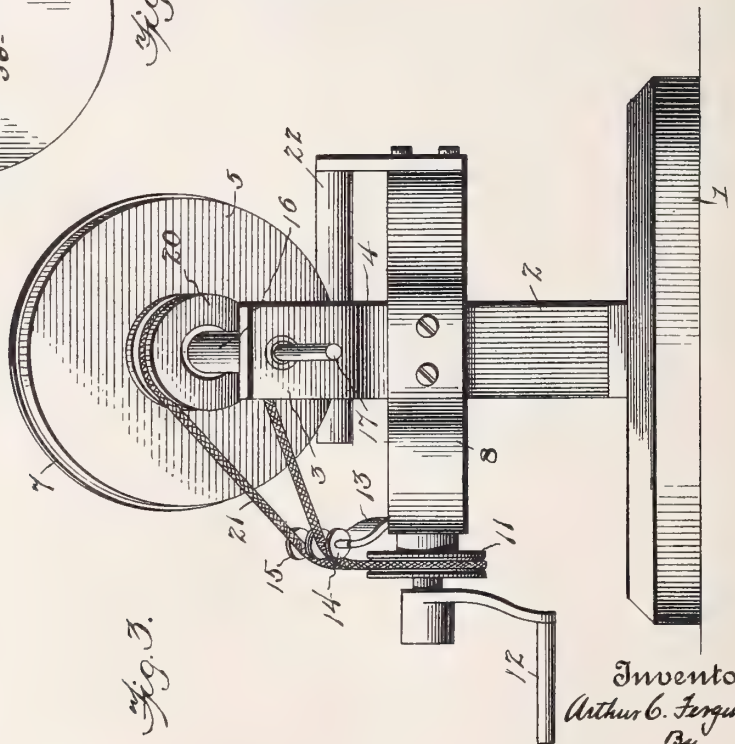
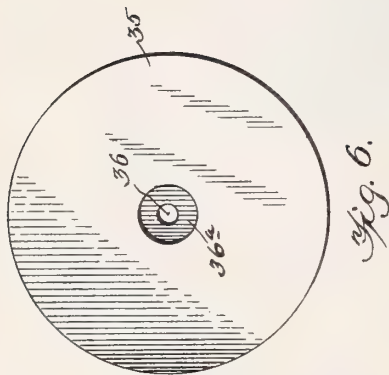
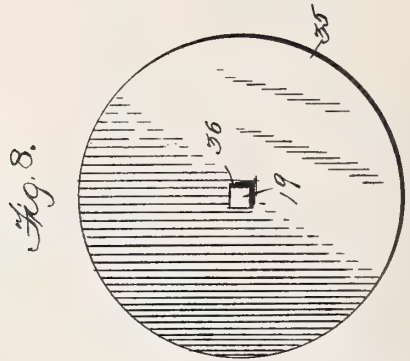
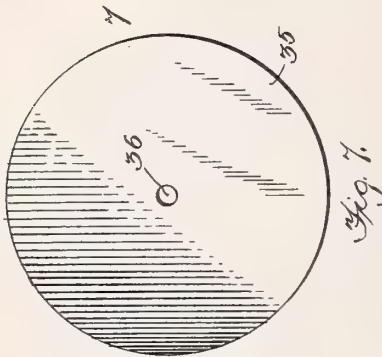
A. C. FERGUSON.
GRAPHOPHONE.

Patented July 17, 1900.

(No Model.)

(Application filed Oct. 9, 1899.)

2 Sheets—Sheet 2.



Witnesses
C. L. Nocton
L. D. Bradford

Inventor
Arthur C. Ferguson.
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his Attorney

UNITED STATES PATENT OFFICE.

ARTHUR C. FERGUSON, OF NEW YORK, N. Y.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 653,667, dated July 17, 1900.

Application filed October 9, 1899. Serial No. 733,057. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR C. FERGUSON, a citizen of the United States, residing at New York, (Brooklyn,) in the county of Kings and State of New York, have invented certain new and useful Improvements in Apparatus for Recording and Reproducing Sound; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to means for recording and reproducing articulate speech, as well as musical and other sounds; and it consists, substantially, in such features of improvement as will hereinafter be more particularly described.

In carrying my invention into effect I provide a suitable apparatus or machine comprising a rotary disk or support, a separate or detachable disk covered with suitable material adapted to be indented, and a vibrating diaphragm combined with a movable point for producing indentations upon the covering of the said separate or detachable disk. In operation by causing any sound to be projected against the diaphragm—as, for instance, the human voice in speaking or singing—the said diaphragm will vibrate corresponding to the depth or pitch of the voice, and a rapid motion being thus imparted to the said movable point the latter by playing upon the surface of the covering of the removable or detachable disk will indent the same in correspondence with the vibrations of the said diaphragm, and thereby accurately record the sound, whatever be its nature. While recording the sound in this manner, the construction and operation of the parts are such that the indentations are produced in concentric lines, so that the entire surface of the covering of the detachable or removable disk may be thus utilized, and after the desired record has been made it is simply necessary to replace the movable point at the position of starting, whereupon by a continuance of the rotary motion of the said disk an exact reproduction of the sound is obtained.

My invention is based upon the principle of operation of the well-known "Edison"

phonograph-machine; but the particular apparatus or machine which I employ is much more simple in its construction and arrangement, and instead of employing a wax cylinder or a cylinder covered with tin-foil I employ a suitable disk covered with metal foil or its equivalent as the element or medium for obtaining the record and reproduction of the sound. By the use of such a disk I obtain a smooth unbroken surface of foil without the exercise of the care necessary with a cylinder to bring the meeting edges of the foil together and which if not effected with accuracy results in imperfect records and reproductions as well. The principal object I have in view, however, in the employment of such a disk is to provide a sound recording and reproducing medium which is exceedingly light and strong and one which is capable of transmission through the mails without danger of rupture or distortion and at no greater cost to the sender than that of an ordinary letter. Thus it will be seen that individuals at distant points each having a machine can carry on correspondence in a secret or most private manner. The cost of the disk as compared with that of a cylinder is very small, since the same is readily cut out by means of suitable dies and requires no subsequent shaping or manipulation to adapt it to the machine. The said removable or detachable disk is simply placed upon the permanent rotary disk, and whenever a record of sound is to be made—as of speech, for instance—the voice is thrown upon the diaphragm through an ordinary funnel in the usual way, and then when the reproduction is effected the emission of the sound also takes place through the funnel.

It is my purpose to manufacture the removable or detachable disks in large quantities and to sell the same in lots or packages, so that a person having provided himself with a machine can readily obtain the disks as they may be needed or required. Preferably the disks will be sold ready covered with tin-foil; but it is evident that the user can cover them when required with but little difficulty. As a further special feature of the removable disk it will be noted that the same is constructed to be supported in proper position

upon the permanent disk of the machine when placed thereon for use, thus requiring no fitting or cutting thereof after purchase.

The above and additional objects and advantages of my present improvements will be more fully hereinafter understood when taken in connection with the accompanying drawings, in which—

Figure 1 is a view in perspective of a machine constructed and arranged in accordance with my invention, and Fig. 2 is a similar view from the rear of the vibratory diaphragm detached. Fig. 3 is a rear view of the machine to more clearly indicate the arrangement. Fig. 4 is a sectional view through the center of the permanent rotary disk or support, and Fig. 5 is a sectional view of the removable or detachable disk to show how in some instances the edge of the metal foil is turned over the edge of said disk. Fig. 6 is a face or front view of the removable or detachable disk to show the bared central portion thereof. Fig. 7 is a similar view of said removable disk, showing the same with the foil covering extending all the way to the control-opening thereof and with said opening of rounded form. Fig. 8 is also a similar view representing the central opening of the removable disk as rectangular and showing a similar form of projection therethrough from the permanent disk or support.

In the drawings, 1 represents a suitable base, upon which is mounted and secured a suitable standard 2, the upper portion 3 of which is bent or turned back slightly at 4, by which the permanent rotary support or disk 5, hereinafter described, is given a slight rearwardly-inclined position, the better to observe the progress of the indentations delineated upon the covering of the removable or detachable disk 7, also hereinafter more specifically referred to. Secured to the said standard 2 is a yoke or frame 8, preferably semicircular in shape and with its two arms or branches 9 projecting forwardly or toward the front of the machine. Journaled in suitable openings in said arms or branches 9 is a horizontal shaft 10, having a right-hand screw-thread of suitable pitch, and one end of said shaft projects beyond the yoke or frame and is provided with a driving belt-pulley 11 and an operating crank or handle 12. The arm or branch 9 of the said yoke or frame contiguous to the said belt-pulley and crank is provided with an upwardly-projecting arm or member 13, in the upper end of which is rotatably mounted two small guide-pulleys 14 and 15.

Attached to the upper bent portion 3 of the standard 2 is a sleeve 16, having a slight forward and upward inclination preferably, and through which sleeve passes a short shaft 17, to the forward upper end of which is attached or secured a permanent disk or support 5, through the center of which the end of said shaft 17 projects, as at 19. Secured to the under side of the permanent disk or support

5 is a pulley 20, which is concentric with shaft 17, and passing around this pulley and over the guide-pulleys 14 15 and thence around driving-pulley 11 is a driving cord or belt 21.

Supported by the arm 9 of the yoke or frame opposite to the driving-pulley and operating-crank is a guide-bar 22, which is elevated above and parallel to the screw-shaft 10, and moving on this bar is a slide 23, to which is connected a traveler or half-nut 24, that rests upon the screw-shaft and is caused to travel to the right whenever the operating handle or crank is turned. Said slide is capable of being turned outwardly on the guide-bar, so as to elevate the half-nut from the screw-shaft and permit the said slide and half-nut to be moved back after the same have reached the limit of movement in the right-hand direction. Removably fitted to a block 25, carried by said slide, is an ordinary Edison diaphragm 26, provided with a vibrating or movable point 27 on the inner side, (see Fig. 3,) which when any sound is projected against the said diaphragm is caused to move rapidly against the removable disk and which latter being covered with tin-foil or its equivalent will be indented accordingly.

Connecting the half-nut 24 with the base or other part of the machine is a spring 30, which tends to hold the nut steadily in place on the screw-shaft 10 as the latter is operated to produce a sound-record.

From the foregoing it will be seen that by first placing the slide and its diaphragm, together with the half-nut, at the left of the machine and then turning the operating crank or handle the permanent and detachable disks will be rotated together, while at the same time the diaphragm and slide will be carried to the right by movement of the half-nut, and in this way the indentations produced upon the surface of the covering of the removable disk will be in continuous concentric lines.

In order to project or concentrate the sound upon the diaphragm, I employ a suitable detachable funnel 30, which is supported or held in position by means of a suitable wire bracket 32, secured at one end to the base 1.

The removable or detachable disk 7 can be of any suitable material; but preferably I make the same of thin aluminium, and the same is covered with suitable material adapted to be indented easily, preferably metal foil. Thus in Figs. 5 to 8 the covering of metal foil is designated at 35. As previously stated herein, I propose to manufacture and sell the said disks in quantities, and in order that there will be no difficulty in placing the same in position for use quickly I construct it to be received upon the permanent rotary support or disk 5 of the machine—as, for instance, by fitting around the projecting end 19 of the shaft 17. Ordinarily I can construct the said disk with a central opening 36 either round, as in Fig. 7, or rectangular, as in Fig. 8, and by also making the projection 19 of corresponding shape the said disk will

be held in place by simply slipping the same upon the projection and then pushing it back against the permanent disk 5. Sometimes, however, when the projection 19 is round I thread the same, Fig. 2, and I then employ a nut 40, screwing thereon, simply as an additional safeguard to prevent the removable disk from slipping off. The use of this nut is not absolutely necessary, however. Sometimes when the same is employed I prefer to remove a portion of the metal-foil covering of the removable disk and leave the latter bared at 36^a for a space at least equal to or slightly in excess of the diameter of the said nut 40, so that in screwing the nut up tightly against the disk there will be no danger of tearing or disturbing the foil covering by abrasion.

In order to entirely cover the outer surface of the removable disk and also to present no edge of the metal foil at the edge of the said disk, I prefer that the said foil covering shall lap over or be folded around the edge of the disk at 39, (see Fig. 5,) and in this case I provide the outer or upper surface of the permanent rotary disk 5 with an annular recess 41 at the edge, which serves to receive the turned-over portion of the tin-foil covering and permits the removable disk to lie flat against the said permanent disk. I need not adhere strictly to this arrangement, however.

From the foregoing description regarding the removable disk it will be understood that the same is substantially a separate article of manufacture in itself and embodies a structural form adapting it to be at once fitted in place for use in connection with the permanent disk of this or any other similar sound recording and reproducing machine.

By forming the removable or detachable disk with the central rectangular opening I provide means by which the said disk is readily placed on and taken from its support, and while the same is in position it cannot rotate independently of said support, and by turning the foil covering around the edge of the disk not only is such covering held in place without the use of adhesives or other means, but at the same time an annular flange of the foil is formed or produced on the rear or inner face of the disk, which flange is received in the recess on the support, so as to permit the said disk to lie in place flatly and firmly without independent vibrations thereof, and besides this turned-over edge of the foil prevents in a very large degree the tearing of

the foil from the disk, such as would be apt to occur from handling of the completed disk or on insertion of the same in an envelop, provided the edge of the foil extended only to the edge of the disk. My improved detachable disk thus presents many advantages over disks heretofore employed in this class of devices.

Without limiting myself to the precise details herein shown and described, I claim—

1. In a machine for recording and reproducing sound, the combination of a permanent rotary disk or support recessed at the edge on its upper surface, a removable disk thereon having a metal-foil covering with folded-over edge received by said recess, a traveler or nut, a vibrating diaphragm and movable point moved along by said traveler, and means for operating the parts, substantially as described.

2. In a machine for recording and reproducing sound, the combination with a suitable base and standard thereon, of a semicircular yoke or frame secured to the standard with the branches thereof projecting forwardly of the machine, a screw-shaft journaled in said branches, and a guide-bar parallel therewith, a sleeve attached to the upper portion of the standard, a shaft passing through said sleeve and provided with a permanent rotary disk through the center of which the end of the shaft projects, a removable disk on said rotary disk, the same having a covering of indelible material, a block on the guide-bar, a traveler or nut moving on the screw-shaft and attached to the block, a vibrating diaphragm and movable point moved along by said traveler, and means for operating the parts, substantially as described.

3. The removable or detachable disk having a central rectangular opening adapting it for immovably fitting a support therefor, the said disk having a covering of metal foil folded around the edge of the same so as not to present any edge of the foil at the edge of the disk, and so as to form a raised flange on the inner or rear surface of said disk, substantially as shown and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

ARTHUR C. FERGUSON.

Witnesses:

E. EVERETT ELLIS,
FRANK D. BLACKISTONE.

No. 654,018.

Patented July 17, 1900.

O. E. PAYNE.

GRAPHOPHONE DRIVE MECHANISM.

(Application filed June 14, 1899.)

(No Model.)

Fig. 1.

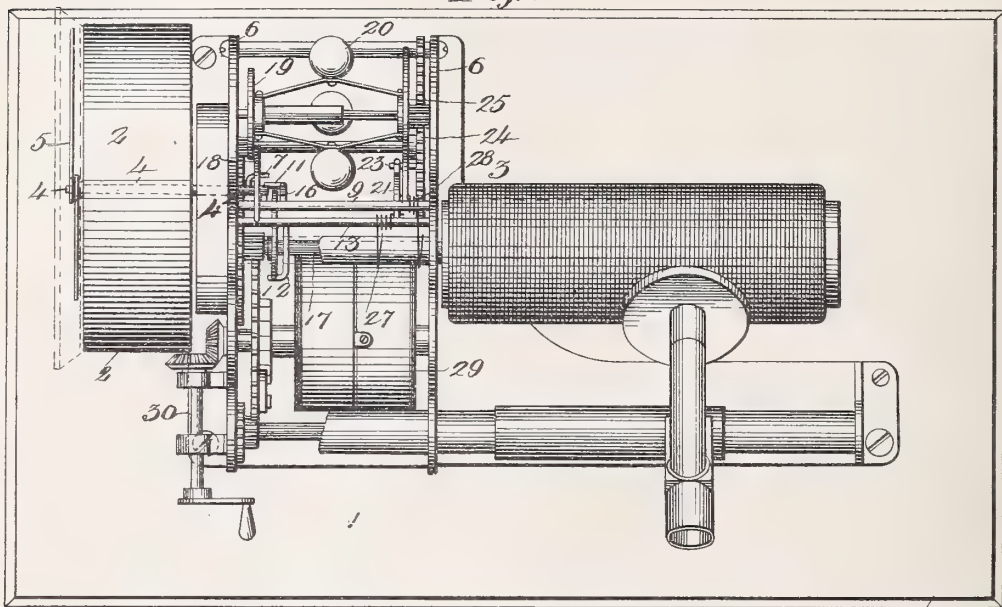


Fig. 2.

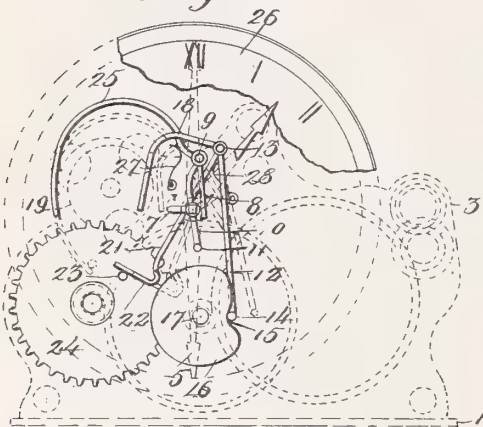
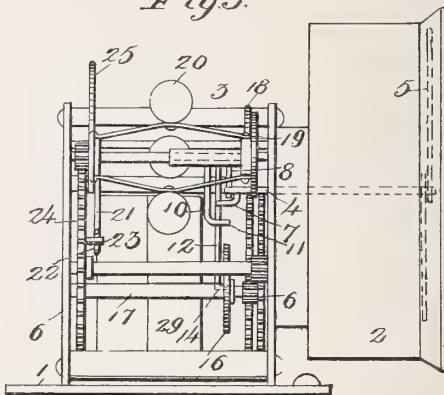


Fig. 3.



WITNESSES:

Alfred A. Mathew
W. M. Butler

INVENTOR

Omar E. Payne

BY

Keller & Keller
ATTORNEYS.

UNITED STATES PATENT OFFICE.

OMA E. PAYNE, OF ST. LOUIS, MISSOURI.

GRAPHOPHONE DRIVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 654,018, dated July 17, 1900.

Application filed June 14, 1899. Serial No. 720,589. (No model.)

To all whom it may concern:

Be it known that I, OMA E. PAYNE, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Clocks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in clocks; and it consists in the novel combination and arrangement of parts, as will be hereinafter more particularly described and claimed.

In the drawings, Figure 1 is a top plan view of my complete invention. Fig. 2 is a front elevation of the same, showing a portion of the clock-dial, the phonograph partially in dotted lines, and the parts cooperating with the clock mechanism and the phonograph in full lines; and Fig. 3 is a side view of my complete invention.

The object of my invention is to combine a phonograph, graphophone, or other machine or device for either representing the human voice or the representation of sounds with a clock or mechanism thereof or other timepiece, whereby the said phonograph will be intermittently and automatically operated or set in motion at each hour indicated by the timepiece, or fraction thereof, as may be desired, whereby the different intervals of time will be indicated by the reproduction of the human voice or other sound, as may be desired, instead of an alarm or other indicator, as heretofore employed for this purpose.

Referring to the drawings, 1 represents a bed or support upon which the entire machine is secured, 2 an ordinary clock mechanism, and 3 a phonograph which is mechanically connected to the former. The phonograph proper is of the usual construction, the clock mechanism 2 being attached to the same or located in close proximity thereto, and, as shown in the drawings, the shaft 4 of said clock mechanism, to which the minute-hand 5 is attached, projects a suitable distance rearward and through the side frame 6 of the phonograph, and secured to said projecting end of the shaft 4 is a short arm 7, which is adapted to be turned by the same and inter-

mittingly brought in contact with the arm 8 at every complete revolution of the shaft 4, said arm being secured to and carried by a transverse shaft 9, the opposite ends of which are journaled in the opposite side frames 6 of the phonograph. Also secured to said shaft 9 and depending therefrom adjacent to the arm 8 is an arm 10, having lower bent horizontal portion 11, which is adapted to be brought in contact with the long arm 12, carried by the transverse shaft 13, the opposite ends of which are also journaled in the opposite side frames 6 of the phonograph. The lower end of the long arm 12 is also provided with a bent horizontal portion 14, which is normally located within the depression or reduced portion 15 of the cam 16, the latter being secured to a shaft 17, forming a part of the phonograph. The shaft 13 is also provided with a hooked arm 18, which is normally in contact with one side of the disk 19, forming a part of the ordinary speed regulator or governor 20, the latter forming the ordinary part of the phonograph, the said arm 18 and its cooperation with the disk 19 of the governor operating as a friction-brake in checking the momentum of the mechanism comprising the phonograph proper before the same comes to rest. Depending from and also secured to the shaft 13 is a rod 21, the lower end of which is bent, forming an abutment 22, against which the pin 23 is normally in contact when the machine is at rest, the said pin being carried by and secured to one side of the gear-wheel 24, which also forms a part of the operating mechanism or gearing of the phonograph. Secured to and carried by the shaft 9 is a curved engaging arm 25, against which the pin 23 comes in contact after the same has been released by the rod 21, the said curved arm 25 holding said pin momentarily at the preliminary starting of the phonograph by the clock mechanism.

By the arrangement and construction of the parts previously described the minute-hand 5 when moved in front of the numeral 12 of the clock-dial 26 will cause the short arm 7 of the minute-shaft 4 to move to the right, rocking the shaft 9 and simultaneously bringing the horizontal portion 11 of the arm 10 in contact with the long arm 12, in which operation the horizontal portion 14 of said arm 12 will be

moved out of the depression 15 of the cam 16. In the same operation the lower end 22 of the arm 21, carried by the shaft 13, will be moved out of its engaging position with the pin 23 of the gear 24, and simultaneously with the
 5 rocking of said shaft the hooked arm 18 will be moved out of its frictional engagement with the disk 19 of the speed-regulator 20, whereby the operative mechanism of the phonograph
 10 is free to be operated by the usual spring mechanism forming a part of said phonograph. The short arm 7 when it first strikes the arm 8 rocks the shaft 9 sufficiently to bring the curved engaging arm 25 in a position to hold
 15 the pin 23 momentarily; but as the said short arm 7 is further moved it will slip off the end of the arm 8 and allow said curved arm 25 to assume its normal position, whereby the mechanism of the phonograph is permitted to
 20 operate for a certain length of time or until the shaft 17 has completed one revolution and the horizontal portion 14 of the long arm 12 has again entered the depression 15 of the cam 16, in which operation friction will be ap-
 25 plied to the speed-regulator 20 in a manner previously described and the lower end 22 of the rod 21 brought in a position to cause the pin 23 to strike the same, and thereby instantly check the momentum of the machine.
 30 In order to hold the various parts in their normal position or that shown in solid lines, Fig. 2, a spring 27 is employed, the free end of which engages with the curved arm 25, whereby all the parts carried by the shaft 9,
 35 to which the said arm is secured, are held in their proper position, and in order to hold the parts carried by the shaft 13 in their normal position a spring 28 is employed, the free end of which coöperates with the arm 21.
 40 The device as above described is designed to be actuated once in every hour; but it is quite evident that any number of short arms 7 may be attached to the minute-shaft 4 of the clock mechanism, whereby the phono-
 45 graph could be operated intermittently during any fraction of an hour.

The casing 29, which surrounds or covers the spring mechanism for operating the phonograph and which is of the usual construction, may be supplied with any suitable wind-
 50

ing mechanism 30, such as shown in Fig. 1, and therefore I make no claim to this portion of the machine, the principal object being to mechanically connect a clock or other time-
 55 piece to a phonograph of any well-known construction in such a manner that the latter will be intermittently operated or set in motion by the clock mechanism to indicate the hours or the fractions thereof in a manner
 60 previously described, and therefore I wish it distinctly understood that I do not limit myself to the precise construction and arrangement as herein shown and described, as the same may be modified in many respects with-
 65 out departing from the nature of my invention.

Having fully described my invention, what I claim is—

1. A clock having a minute-hand shaft extending through the works and outside the
 70 rear thereof, a short arm carried by said shaft upon its extension, combined with a phonograph having suitable gearing, a cam operated by said gearing, a shaft, an arm secured to said shaft and operated upon by the cam,
 75 a rod also secured to said shaft, and intermediate means for causing the short arm to operate the last-mentioned arm to set the phonograph in operation.

2. A clock, comprising a phonograph, suitable gearing forming a part of the latter, a cam operated by said gearing, and provided with a depression, a shaft, an arm secured to the latter, and coöperating with said cam, a
 80 rod also secured to said shaft, a pin carried by the gearing of the phonograph, and coöperating with the lower end of said rod, a minute-shaft, a short arm forming a part of the same, and suitable mechanism with which the said
 90 short arm coöperates for releasing the gearing of the phonograph, whereby the latter is intermittently operated, as and for the purpose described.

In testimony whereof I affix my signature in presence of two witnesses.

OMA E. PAYNE.

Witnesses:

ALFRED A. MATHEY,
 LOUIS P. KELLER.

No. 654,099.

Patented July 17, 1900.

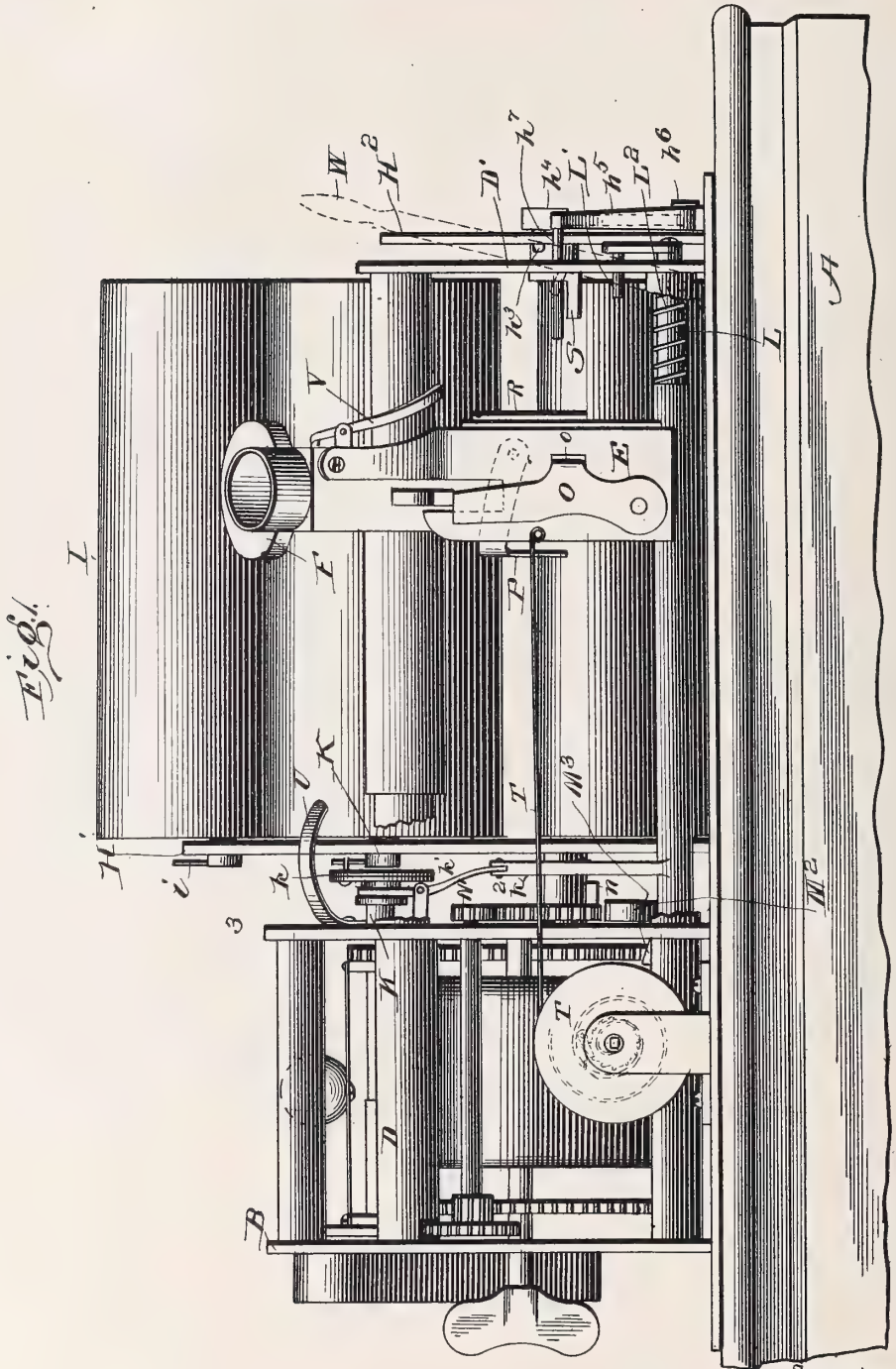
P. S. BATES.

SOUND REPRODUCING INSTRUMENT.

(Application filed Oct. 10, 1899.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses
J. M. Fowler
J. H. Peyton, Jr.

Inventor
 Peter S. Bates,
 by *Church & Church*
 his Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 654,099.

Patented July 17, 1900.

P. S. BATES.
SOUND REPRODUCING INSTRUMENT.

(Application filed Oct. 10, 1899.)

(No Model.)

3 Sheets—Sheet 2.

Fig. 2.

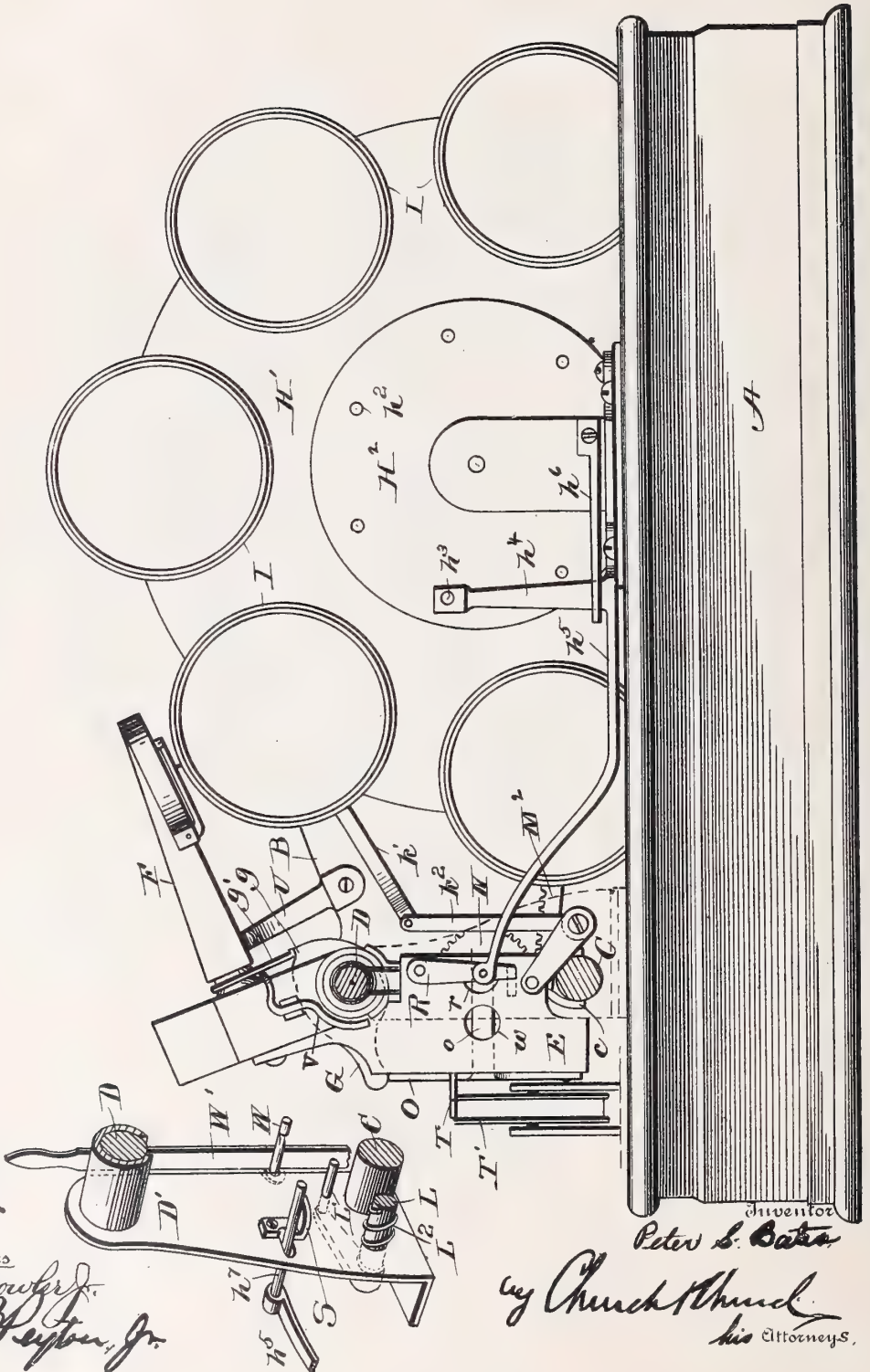


Fig. 4.

Witnesses
J. M. Fowler
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by Church & Church
his Attorneys.

No. 654,099.

Patented July 17, 1900.

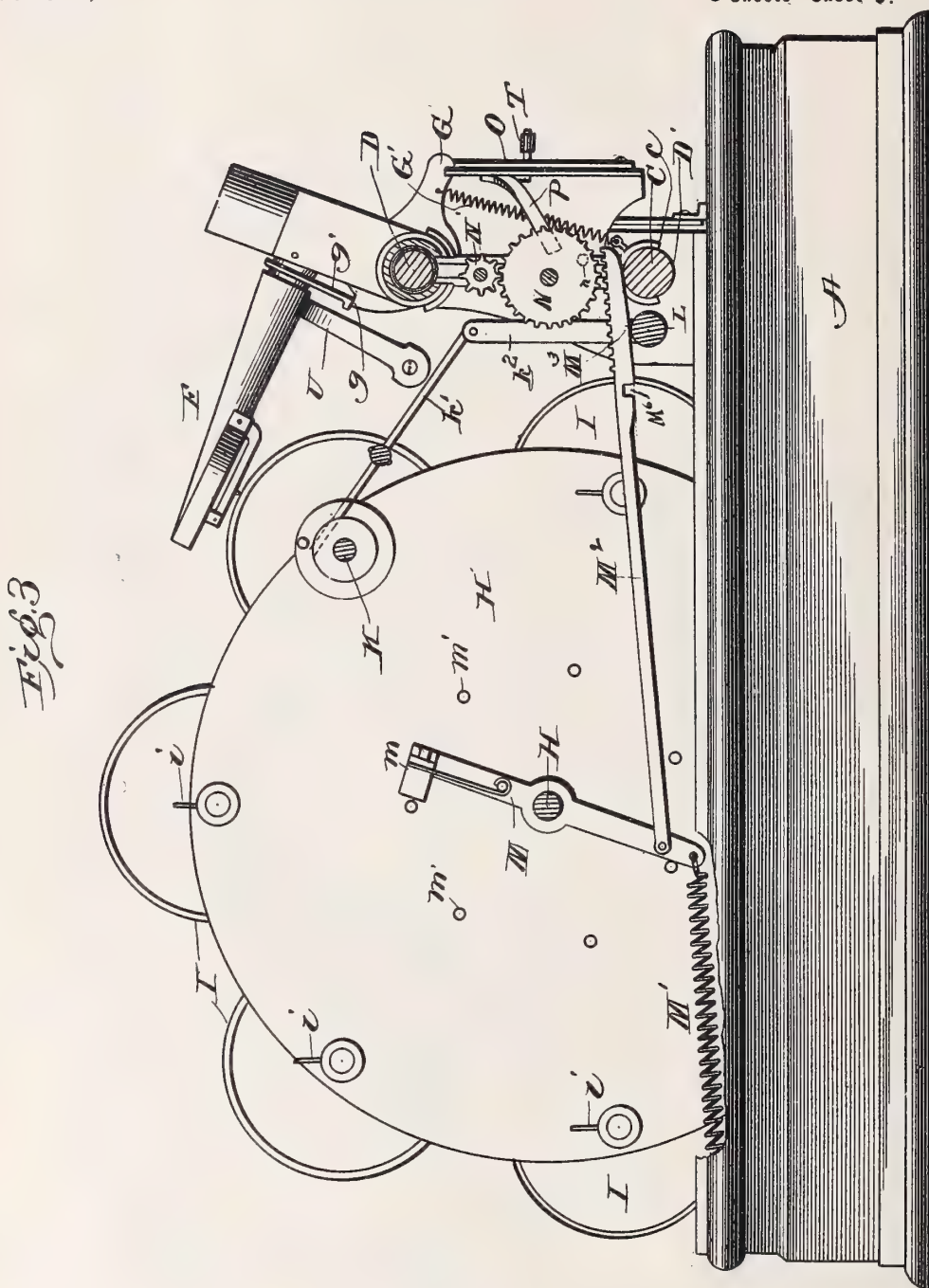
P. S. BATES.

SOUND REPRODUCING INSTRUMENT.

(Application filed Oct. 10, 1899.)

(No Model.)

3 Sheets—Sheet 3.



UNITED STATES PATENT OFFICE.

PETER SYLVANUS BATES, OF YORK, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO EDWIN W. LOUCKS, OF SAME PLACE.

SOUND-REPRODUCING INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 654,099, dated July 17, 1900.

Application filed October 10, 1899; Serial No. 733,159. (No model.)

To all whom it may concern:

Be it known that I, PETER SYLVANUS BATES, a citizen of the United States, residing at York, in the county of York and State of Pennsylvania, have invented certain new and useful Improvements in Sound-Reproducing Instruments; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

This invention relates to improvements in sound-reproducing instruments, such as are commonly known as "phonographs" or "graphophones" and in which the record is formed on the surface of cylinders of composition or material capable of receiving indentations corresponding to the sound to be produced.

It has for its object to provide a mechanism whereby with one reproducer and motor mechanism the records on a number of different cylinders may be successively subjected to the action of the reproducer automatically or a single record may be subjected to such action a number of times, in accordance with the wishes of the operator.

The invention consists in an instrument having a motor mechanism with a reproducer adapted to be automatically reciprocated thereby and a cylinder-carrier for a series of cylinders adapted to be intermittently moved so as to bring each of such cylinders successively within the field of action of the reproducer, such instrument embodying certain novel details of construction and combinations and arrangements of parts, whereby the movements are rendered more certain, the work imposed upon the motor reduced to a minimum, the records preserved against mutilation in the automatic shifting of the device, and the operator entirely relieved from responsibility or care respecting the running of the apparatus other than to see that sufficient power is given the motor should the same weaken or become run down in the operation of the machine.

Referring to the accompanying drawings, Figure 1 is a front elevation of a phonograph or sound-reproducing instrument embodying

my present improvements, the horn being omitted and overlying shafts broken away to disclose underlying parts. Fig. 2 is an elevation looking at the right-hand end of the machine shown in Fig. 1 with the end frame which supports the reproducer removed and the reproducer-shafts in section. Fig. 3 is a section on the line 3 3, Fig. 1, with the base in elevation. Fig. 4 is a perspective view showing the right-hand end of the reproducer-frame, which is omitted in Fig. 2.

Like letters of reference in the several figures indicate the same parts.

The letter A indicates a base or support of any suitable character, preferably, however, made ornamental, as shown, and upon which is mounted a frame B, which at the left-hand end carries a motor, and governing mechanism for regulating the speed of the motor, preferably, such as is in common use at the present day on phonographs, and therefore need not be further described.

Extending across the front of the frame B are the usual shafts C and D for the reproducer-carriage E, the upper one, D, of said shafts containing the usual screw for advancing the carriage, and the lower shaft C being embraced by a fork c at the bottom of the carriage for maintaining the carriage in its proper vertical position. At the right-hand end of the machine the said shafts C and D are united by an end frame D', Fig. 4.

The reproducer F is pivotally mounted on the upper portion of the carriage and is adapted to be elevated when so desired by a trip or cam G, pivoted in the carriage and having a nose or projection g, adapted to contact with a foot g' on the reproducer. In the present construction this trip G is held normally in position to raise the reproducer by means of a spring G', the tension of which must be overcome by appropriate mechanism, to be presently described, before the reproducer is lowered and the carriage thrown into engagement with the feed-screw, the construction of the trip G for effecting the engagement of the carriage with the screw being of the usual construction and forming no part of my present invention.

In rear of the feed-screw and reproducer-carriage there is mounted in the frame B or

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upon appropriate standards extending upwardly from the base A a cylinder or record-carrier consisting of a shaft H, having at one end a relatively-large disk or support H',

5 around the periphery of which and in regular order are journaled the cylinder-cones I. The shafts which are connected with the cones I preferably extend through the disk H' and are provided with transverse projections or

10 pins i , adapting them for engagement with the motor mechanism when in position for the reproducer to coöperate with the cylinder carried by the cones. The opposite ends of the cones I are unobstructed, as in the case of the

15 ordinary graphophone, adapting the device for having the cylinders readily slipped on or off the same; but within the circle of cylinders at this end of the machine the shaft H is provided with a second disk H², Fig. 2, constituting a locking-disk and with which a

20 locking mechanism, to be hereinafter described, is adapted to coöperate for holding the cylinders rigidly while the record on one of them is being traversed by the reproducer.

25 The motor embodies a cylinder-driving shaft K, and in the automatic running of the machine each cylinder is successively brought into alinement with this shaft K and coupled therewith by a clutch, after which the carriage and reproducer are advanced until the

30 end of the record is reached, when the movement of the carriage automatically effects the raising of the reproducer, the unlocking of the cylinder-carrier, the disengagement of the clutch between the cylinder-cone and its shaft K, and the engagement of the motor with the cylinder-carrier to advance the carrier until

35 the next cylinder is in position, and, finally, the disengagement of the carriage from the feed-screw permitting said carriage to automatically return to its starting position under the influence of a separate return-motor. To accomplish these results the shaft K is provided with a longitudinally-movable clutch k ,

40 controlled by the shifting-lever k' , and the latter is in turn connected with an arm k^2 on a longitudinally-movable shaft L, which latter extends from the motor end of the machine to and through the frame D' and carries a pin or inwardly-extending projection L', Fig. 1,

50 with which the carriage is adapted to contact for moving the shaft longitudinally against the tension of a spring L³, surrounding the same. The disk H², before referred to as constituting part of a lock for holding the cylinder-carrier, is preferably provided with a

55 series of apertures h^2 , with which a conical pin h^3 on the upper end of an arm h^4 of a lock-frame h^5 is adapted to coöperate. The lock-frame h^5 is pivoted to the base at the rear end and advanced by a spring h^6 , while at its forward end it is provided with a relatively-long pin or projection h^7 , extending inwardly through the frame D' and in position

60 to contact with the reproducer-carriage E as the latter reaches the farther limit of its movement. The carriage E first contacts with the pin h^7 and finally with the projection L'. Thus the cylinder-carrier is unlocked and also disengaged from the cylinder-motor

70 shaft by the forward travel of the carriage, and in order to effect the feed or advance of the cylinder-carrier an oscillatory drive-pawl M is provided, preferably mounted on the shaft H in proximity to the disk H'. One end

75 of said drive-pawl is provided with a spring-pressed nose m , adapted to coöperate with one of a series of pins or teeth m' on the disk H' and corresponding in number to the number of cylinder-cones carried thereby. A

80 spring M' is provided for moving the pawl M in one direction, while a rack-bar M² is provided for moving it in the opposite direction to advance the cylinder-carrier. This rack-bar M² extends forwardly, preferably

85 above the shafts L and C, and is in position to be moved upwardly into mesh with a gear-wheel N, which is driven constantly by the motor when running through the medium of a small pinion N'. The shaft L is provided

90 with a wedge or incline, and when said shaft L is moved longitudinally by the reproducer-carriage E in addition to unclutching the cylinder-drive shaft from the cylinder-cone the incline M³ passes under and moves the

95 rack-bar M² up into engagement with the gear-wheel N to advance the cylinder-carrier. As the rack reaches the end of its stroke a notch or recess M⁴ comes opposite the incline and allows the rack to drop out of mesh with

100 its gear. Then when the shaft L returns to normal position the incline moves out of the notch and the rack-bar is free to return to its normal position. A pivoted retainer O, mounted on the reproducer-carriage and hav-

105 ing an arm o , Fig. 2, extending back through said carriage, is provided for holding the trip G in position to permit the reproducer to engage with the record on the cylinder, such retainer being preferably moved by gravity

110 in beneath the forward end of the trip G whenever the latter is raised, and in order to raise the trip G when the carriage is at the left-hand end or starting-point the gear-wheel N is provided with a pin or projection

115 n , adapted to pass under and raise an elevator-arm P, pivoted on the reproducer-carriage and working up under the forward end of the trip G, as will be readily understood from an inspection of Figs. 1 and 3, such ele-

120 vator-arm, however, normally being in its lowermost position and inoperative save when the carriage is at the starting-point, when it is brought within range of the projection n .

125 In order now that the carriage may be automatically disengaged from the feed-screw and the reproducer held elevated during the return movement and that such disengagement and return movement shall take place after the cylinder-carrier has advanced, the

130 said carriage is provided on its left-hand side with a pendulous guard R, adapted normally to hang vertically over an aperture r in the side wall of the carriage and to coöperate

with the pin a^7 of the locking mechanism to release the latter. The engagement of the pin h^7 with the guard R takes place before the carriage has reached the extreme end of its travel, and as the carriage continues its movement the said guard strikes and is deflected rearwardly by an incline S on the end frame D', (see Fig. 4,) thereby riding out of engagement with the pin h^7 , and the latter, under the influence of its spring h^6 , passing inwardly through the aperture r , coöperates with the arm o on the retainer O, releasing the latter from its engagement with the trip G, which thereupon drops and disengages the carriage from the feed-screw, the tapered pin simultaneously entering one of the apertures in the disk H². The carriage being disengaged is at once returned to the starting-point through the medium of a flexible connection T, extending from the carriage to and around a return-motor drum T', located on the base at the left-hand end of the instrument. When so returned, the elevator-arm is brought within range of the projection n and the trip G raised, so as to allow the reproducer to engage the cylinder to throw the carriage into engagement with the feed-screw; but in order to prevent the reproducer from dropping suddenly upon the cylinder I prefer to arrange a spring or incline U in position to receive the impact of the reproducer as it drops and to allow the same to pass down upon the cylinder gradually as the carriage begins its forward movement.

Inasmuch as with the mechanism described the reproducer is raised only as the carriage begins its return movement and as it is desirable that the cylinders shall have completed their change at this time provision is made for preliminarily raising the reproducer in order that there may be no danger of injuring the reproducer or mutilating the record as the cylinder-carrier advances. For this purpose a bent arm V is pivoted to the left-hand side of the carriage, with its forward end lying beneath the base of the reproducer, while its outer end extends down into position to contact with the inside of the frame D', so as to raise the reproducer before the lock for the cylinder-carrier is released. Thus the reproducer is entirely disengaged from the cylinder or record prior to the advance of the next record into position.

Where it is desired that the same record shall be gone over again and again, or, in other words, where it is desired that the carrier shall not advance for the presentation of another record, it is obvious that it is only necessary to provide for releasing the trip G before the carrier reaches the controlling-pins L' and h^7 , and for this purpose I have provided a trip device consisting of a pin or projection W, carried by a pivoted handle W' and adapted when in the position shown in Fig. 4 to pass in through an aperture w in the carriage-frame and contact with the arm o , so as to release the trip G before the car-

riage contacts with or advances the pins h^7 and L' a sufficient distance to operate the cylinder-carrier. When it is desired that the records shall be advanced successively, the handle W' may be moved back out of the way or to the position indicated in dotted lines in Fig. 1.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a sound-reproducing instrument, the combination with a record-cylinder support, a motor for driving said support, a reproducer-carriage driven by the motor, a reproducer pivotally mounted on the reproducer-carriage, and means for automatically returning said carriage to its initial position when disengaged from the motor, of a trip mechanism carried by the carriage and independent of the motor controlling the engagement of the carriage and motor and for elevating the reproducer, a throw-out mechanism with which the trip is brought into engagement by the movement of the carriage for rendering said trip operative to release the carriage and raise the reproducer when the carriage reaches the extreme of its movement and a motor-controlled elevator for moving said trip in the opposite direction as the carriage reaches its initial or starting position; substantially as described.

2. In a sound-reproducing instrument, the combination with a record-cylinder carrier, a reciprocating reproducer-carriage, motor mechanism for moving said carriage in opposite directions and a reversing mechanism for reversing the movement of the carriage at opposite extremes of its travel, of an elevating mechanism for the reproducer operative upon the return movement of the carriage and a fixed incline for receiving and supporting the reproducer when released from said elevating mechanism and off of which the reproducer rides as it advances from its starting position; substantially as described.

3. In a sound-reproducing instrument, the combination with a record-cylinder support, a reciprocatory reproducer-carriage, a motor for driving said record-cylinder support and carriage, means for disengaging the carriage from said motor during the return movement of the carriage, and a reproducer pivotally mounted on the carriage, and automatically elevated by the disengagement of the carriage, and motor, of a fixed incline or support upon which said reproducer rests when at the starting-point whereby upon the reengagement of the motor-carriage the reproducer will be allowed to ride down off of the said incline or support and gradually engage or contact with the record-cylinder; substantially as described.

4. In a sound-reproducing instrument, the combination with a record-cylinder-support carrier, having a multiplicity of supports therein, a reciprocatory reproducer-carriage, motor mechanism for rotating said supports,

for moving the carrier intermittingly and reciprocating the carriage, of a reproducer pivotally mounted on the carriage, mechanism controlled by the carriage for coupling the motor and carrier, whereby the carrier is advanced as the carriage reaches the extreme of its movement, the elevator for lifting the reproducer and means for operating said elevator before the carriage reaches the extreme of its movement, whereby the said reproducer is held out of contact with the record-cylinder during the shifting of the carrier; substantially as described.

5. In a sound-reproducing instrument, the combination with a record-cylinder-support carrier, having a multiplicity of supports thereon, each independently rotatable, a reproducer-carriage and a motor mechanism for advancing the carrier, rotating the cylinder-supports in succession as they are advanced into position and reciprocating the carriage with reversing mechanism controlled by the carriage for reversing its direction of movement as it nears each extreme of its travel, of a reproducer pivotally mounted on the carriage, an elevator coöperating with the reproducer as the carriage reaches the extreme of its movement and means for holding said reproducer elevated during the return movement of the carriage; substantially as described.

6. In a sound-reproducing instrument, the combination with a motor and a reproducer-carriage, driven thereby, of a record-cylinder-support carrier, a series of record-cylinder supports journaled therein and adapted to be brought successively into alinement with a motor drive-shaft and a clutch controlled by the carriage for connecting said motor drive-shaft and the cylinder-support in alinement therewith; substantially as described.

7. In a sound-reproducing instrument, the combination with a record-cylinder-carrier support, a series of cylinder-carriers journaled thereon, and having projecting shafts, a lock for holding said carrier in position, and a motor mechanism having a motor drive-shaft for rotating each of said cylinder-carriers in succession and connections between said motor-carrier for moving the latter intermittently, of a reproducer-carriage driven by the motor mechanism, a clutch interposed between the motor drive-shaft and cylinder-carrier in alinement therewith, a controlling mechanism for said clutch operated by the reproducer-carriage, a controlling mechanism for the carrier and a controlling mechanism for the lock for said carrier, both operated by said carriage; substantially as described.

8. In a sound-reproducing instrument, the combination with a record-cylinder-support carrier journaled on a central shaft and having a series of peripheral cylinder-carriers journaled therein with their shafts projecting at one end, a motor having a motor drive-shaft with which said supports are adapted to be brought into alinement, a clutch carried

by said motor drive-shaft and adapted to engage the cylinder-shafts, and a reciprocatory reproducer-carriage driven by said motor, of a train of gearing interposed between the motor and cylinder-support carrier, with means controlled by the reproducer-carriage, for throwing the said train of gearing into or out of action for advancing the carrier or permitting the same to remain stationary, and connections between said clutch and said gear-train-controlling mechanism, whereby said clutch is moved into operative position or out of operative position in unison therewith; substantially as described.

9. In a sound-reproducing instrument, the combination with a motor, a reciprocatory reproducer-carriage driven thereby and a rotary record-cylinder-support carrier, carriers journaled thereon and means for coupling any one of said supports with the motor for rotating the supports, of a drive-pawl for rotating the carrier, a rack-bar connected with said pawl, a gearing driven by the motor and with which said rack-bar is adapted to engage and a shaft controlled by the carriage for moving said rack-bar into mesh with the gear; substantially as described.

10. In a sound-reproducing instrument, the combination with a motor, a reciprocatory reproducer-carriage, driven thereby and a record-cylinder-support carrier having a series of independent record-cylinder supports journaled therein and adapted to be rotated by the motor, of a carrier drive-pawl, a rack-bar connected therewith, a gear-wheel driven by the motor, a longitudinally-movable shaft having a projection extending into the path of the carriage, and an incline on said shaft for moving the rack-bar into mesh with its drive-gear; substantially as described.

11. In a sound-reproducing instrument, the combination with a motor, a reciprocatory reproducer-carriage driven thereby, a record-cylinder-support carrier having a series of independent cylinder-supports journaled therein and a clutch for coupling any one of said supports with the motor, of a carrier drive-pawl, a rack-bar connected therewith, a gear-wheel driven by the motor for moving said rack-bar, a longitudinally-movable shaft having a projection extending into the path of the carrier for moving the shaft longitudinally, an incline on said shaft for moving the rack-bar into mesh with its drive-gear and connections between said shaft and clutch whereby when the shaft is moved longitudinally by the carriage, the connection between the motor and cylinder-support will be broken and the connection between the carrier and motor will be established for bringing a new cylinder into position; substantially as described.

12. In a sound-reproducing instrument, the combination with a record-cylinder support, a motor for rotating said support, and a reciprocatory carriage adapted to be driven by the motor in one direction, with a return-mo-

tor for said carriage, of a reproducer pivotally mounted on the carriage, a trip for raising and lowering said reproducer and engaging the carriage and motor, a spring for holding said trip normally in position to elevate the reproducer and disconnect the motor and carriage, a pivoted retainer for holding the trip in its opposite position of adjustment and a projection lying in the path of said retainer and coöperating therewith to release the trip therefrom as the carriage reaches the extreme of its movement; substantially as described.

13. In a sound-reproducing instrument, the combination of the following instrumentalities, to wit, a reproducing mechanism, a series of record-cylinder supports, a rotary carrier on which said supports are mounted, a motor mechanism, connections between said motor mechanism and carrier and between the motor and one of said cylinders both controlled by the reproducing mechanism, and a lock for said carrier released by the reproducing mechanism in advance of the disengagement of the motor and record-cylinder support and in advance of the engagement of the motor and carrier; substantially as described.

14. In a sound-reproducing instrument, the combination of the following instrumentalities, to wit, a series of record-cylinder supports, a rotary carrier, in which said supports are journaled, a motor mechanism for advancing the carrier intermittingly and for rotating the supports in succession, a reproducer-carriage and reproducer driven by the motor, a return-motor mechanism for said carriage, carrier-controlling mechanism interposed in the path of the carriage near the outer extreme of its movement and tripping mechanism for breaking the connection between the carriage and advancing motor subsequent to the operation of the carrier-operating devices, whereby in the forward movement of the reproducer-carriage, the record-support carrier will be first advanced and

the reproducer-carriage subsequently returned to normal position; substantially as described.

15. In a sound-reproducing instrument, the combination with a motor and a record-cylinder carrier, having a series of cylinders thereon and adapted to be intermittingly rotated to present the cylinders successively, of a reproducer-carriage and reproducer, mechanism controlling the connections between the motor and carrier for moving the latter, said mechanism having projections extending into the path of and adapted to be operated by the carriage, and a trip for releasing the carriage from the motor to permit of its return to initial position, of a throw-out device for releasing said trip before the carriage reaches the projections on the carrier-controlling mechanism, whereby when desired the same record may be reproduced over and over; substantially as described.

16. In a sound-reproducing instrument, the combination of the following instrumentalities, to wit, a rotary carrier, a series of record-cylinder supports journaled thereon, a motor mechanism, a reciprocatory carriage, a lock for holding the carrier having a projection extending into the path of the carriage, a trip for disconnecting the carriage and motor adapted to be operated by said projection, and a movable member interposed between said projection and trip-releasing devices and an incline for moving said movable member whereby the lock will be first released by the engagement of said projection with said movable member and when said member is displaced by the incline said projection will coöperate with the trip mechanism to release the carriage from the motor and permit it to return to initial position; substantially as described.

PETER SYLVANUS BATES.

Witnesses:

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No. 654,317.

T. H. MACDONALD.
GRAPHOPHONE.

Patented July 24, 1900.

(Application filed Oct. 13, 1896.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.

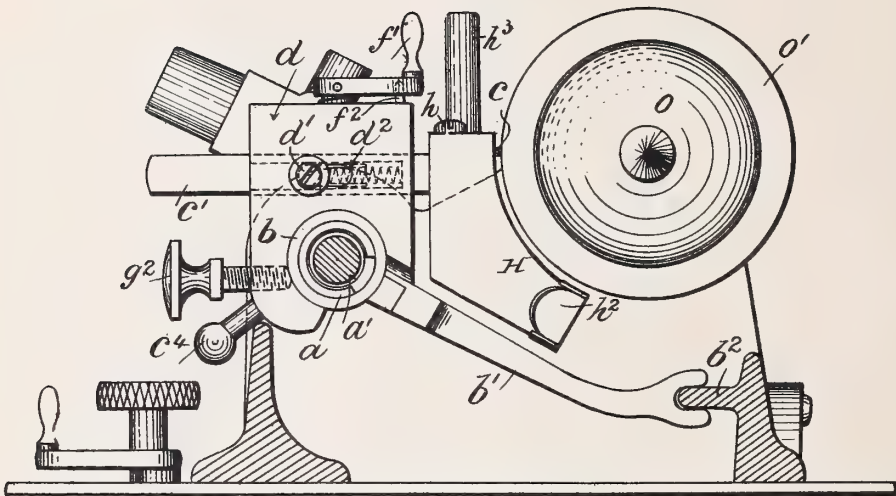


Fig. 3.

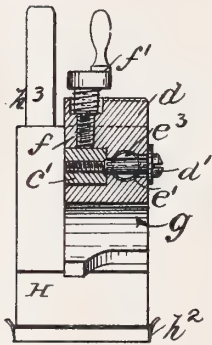
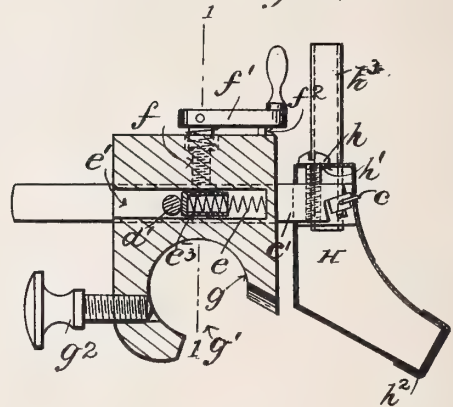


Fig. 4.



Witnesses.
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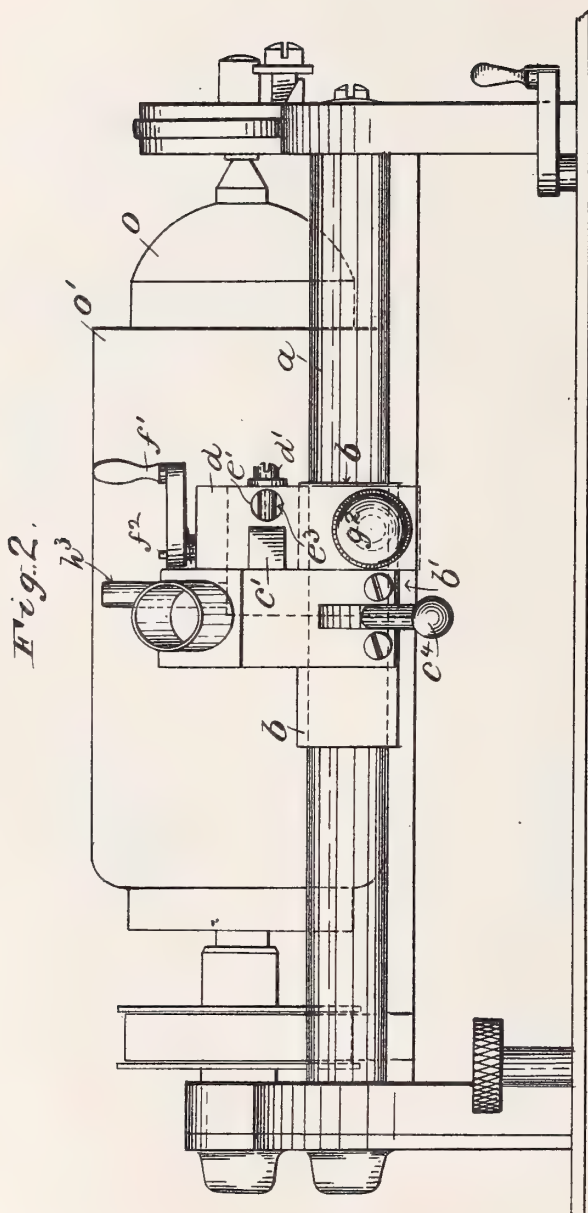
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GRAPHOPHONE.

(Application filed Oct. 13, 1896.)

(No Model.)

2 Sheets—Sheet 2.



Witnesses,
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his attorney

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE AMERICAN GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT OF COLUMBIA.

GRAPHOPHONE.

SPECIFICATION forming part of Letters Patent No. 654,317, dated July 24, 1900.

Application filed October 13, 1896. Serial No. 608,748. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in Graphophones, which improvements are fully set forth in the following specification.

This invention has reference generally to improvements in graphophones, but more particularly concerns the shaving knife or cutter for acting upon the record cylinder or tablet to remove an old record, and thereby present a fresh surface for the recording-style to act upon in making a new record. As ordinarily applied heretofore the shaving-knife forms a permanent part of the machine, being secured thereto in such manner as not to be readily detached, a pan extending beneath the path of the knife serving to catch the chips or shavings. While a large part of the chips fall into the pan, others fly about, falling upon and adhering to surfaces which may be covered with oil, penetrating the joints and gearing and proving otherwise objectionable.

According to my present invention the disadvantages here referred to are completely avoided by making the shaving-knife readily detachable from the machine and in combining therewith a closed receptacle (removable, of course, with the knife) in which the chips or shavings are collected as they leave the knife. After the shaving operation is completed the shaving-knife is removed from the machine and the contents of the receptacle discharged through an opening having a suitable cover. To facilitate the discharge of the chips or shavings, a tube or blowpipe is provided leading to the interior of the receptacle and through which the operator blows. Other advantages of having the shaving-knife and its associated parts detachable from the machine will be apparent.

In the accompanying drawings I have illustrated what is considered a very convenient embodiment of my invention in a practical device which is shown as applied to a machine such as illustrated in Patent No. 569,290, dated October 13, 1896.

Figure 1 is a transverse sectional view through a graphophone of the type illustrated in the patent referred to, showing the shav-

ing-knife attachment in elevation. Fig. 2 is a front elevation thereof. Fig. 3 is a sectional view through the devices for securing the attachment to the carriage of the graphophone; and Fig. 4 is a longitudinal sectional view, partly in elevation, through the attachment.

Referring to the drawings, O represents the mandrel, and O' a record cylinder or tablet thereon.

a' is the feed-screw, about which is the longitudinally-slotted guide-tube a , upon which the sleeve b of the carriage runs.

b' is a depending leg on the carriage, embracing at its end a rail b^2 . The carriage is thrown into and out of engagement with the feed-screw by handle c^4 , all of the parts thus far mentioned being arranged and operating like corresponding parts in the patent referred to and constitute no part of the present invention.

The shaving knife or cutter attachment, which forms the subject-matter of this invention, will now be described.

c is the knife or cutter (preferably a jewel) secured to the end of a rod c' at an oblique angle. Rod c' slides in a recess in the side of a block d , in which it is held by a screw d' , passing through a slot d^2 in the opposite side of the block from that in which the rod slides. The cutter is normally withheld from contact with the record-cylinder by the action of a small spiral spring e , located in the bottom of an opening e' bored into the block, so as to intersect slot d^2 , said spring pressing against the end of a short pin e^3 , sliding in the opening e' and bearing against screw d' . Rod c' is clamped in its adjusted position by a screw-threaded pin f engaging in an interiorly-threaded opening extending downwardly from the top of the block to a point above the rod. Pin f is turned to grip and release the rod by a crank f' at its upper end, the movement of the latter being limited in one direction by a stop-pin f^2 . A circular recess g extends through the block beneath the parts above referred to, said recess being of a diameter but slightly larger than the sleeve b , which it embraces when in position on the carriage and being open on its under side, as at g' , so that it may be engaged about the guide-tube a and then slipped onto the

sleeve *b*, in which position it is secured by a thumb-screw *g*². In securing the attachment in the proper position it is tilted forward until the block rests against the leg *b'*, as clearly shown in Fig. 1.

H is a chips or shavings receptacle into which the end of rod *c'* extends, the receptacle being adjustably secured to said rod by a screw *h* passing through a slot *h'*. Cutter or knife *c* projects through a small opening in the side of the receptacle next to the record-cylinder, said side being made concave to conform to the contour of the cylinder. At its lower end the receptacle is provided with a removable cover *h*², and at its upper end a blow-tube *h*³ leads to the interior thereof.

From the foregoing description it will be clearly understood that when it is desired to remove an old record from the surface of the cylinder or tablet or for any other reason to present a fresh surface to the recording-style, the shaving-knife attachment is secured in position on the carriage and the cutter adjusted to proper contact with the cylinder by means already clearly described and the machine started. The operation being completed, the attachment is removed and the cover *h*² removed from the receptacle H and the contents of the latter readily discharged by blowing into the tube *h*³.

Aside from the advantages resulting from the use of the receptacle for receiving the chips or shavings it is deemed to be of great advantage and broadly new to furnish a shaving-knife and its adjusting devices in the

form of a removable attachment for graphophones. By such arrangement parts which were heretofore permanent parts of the machine and were much in the way during the ordinary running of the latter are now dispensed with except when actually needed. Furthermore, the absence of such devices tends to much simplify the construction of the machine.

The invention is susceptible of embodiment in many other forms than that here shown without departure from the spirit and principle thereof.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a graphophone, the combination with a shaving knife or cutter, of a receptacle for receiving chips or shavings removed from the record-cylinder by said knife or cutter, and a blow-tube leading into said receptacle, substantially as described.

2. A removable attachment for graphophones, consisting of a shaving knife or cutter, a closed receptacle having a discharge-opening therein, a cover for said opening, and a blow-tube leading to the interior of the receptacle, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

C. A. CHADWICK,
CLEMENT MARCH.

No. 654,493.

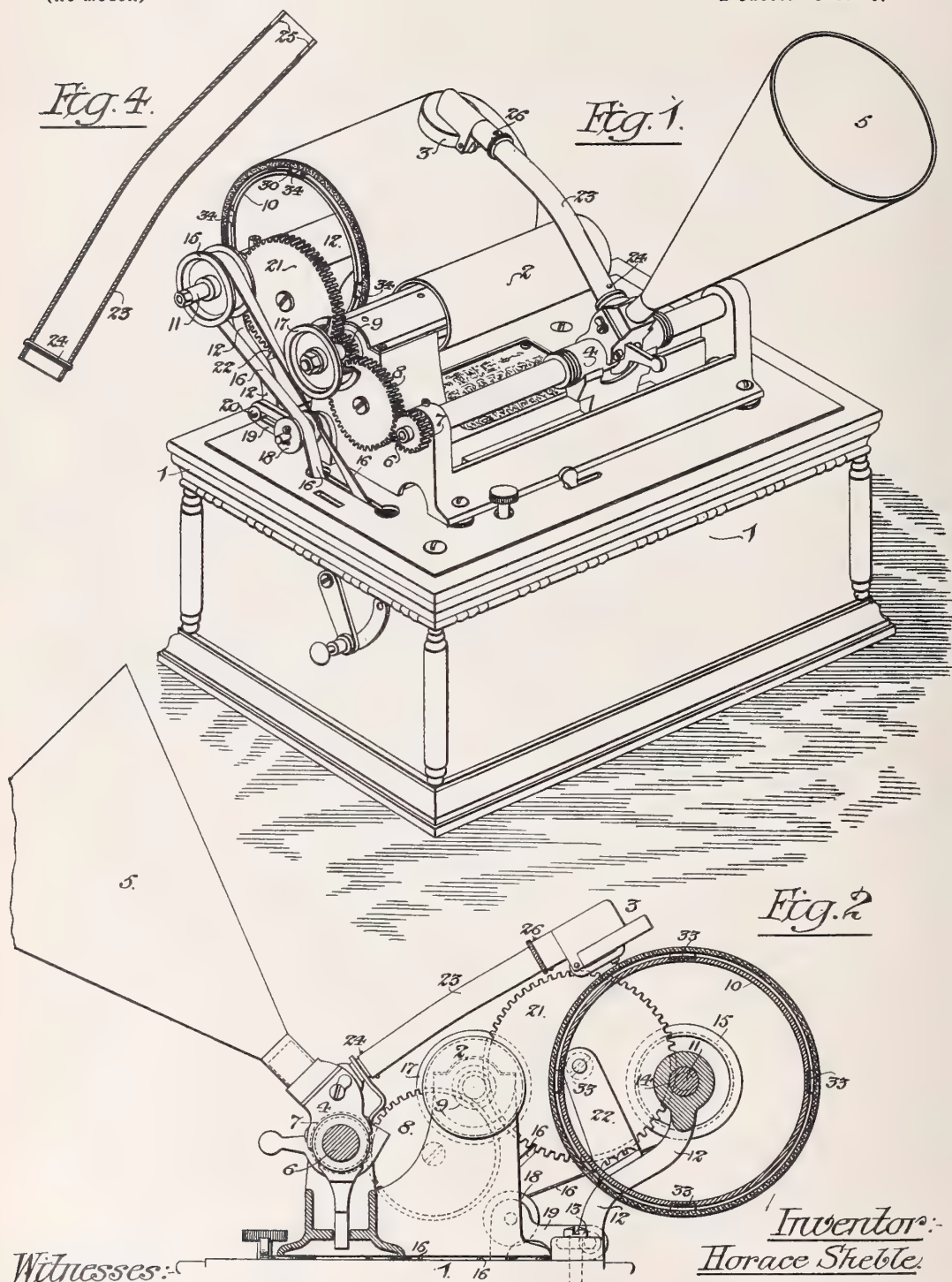
Patented July 24, 1900.

H. SHEBLE.
ATTACHMENT FOR PHONOGRAPHS.

(Application filed Dec. 11, 1899.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
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Howe & Howe

H. SHEBLE.
ATTACHMENT FOR PHONOGRAPHS.

(Application filed Dec. 11, 1899.)

(No Model.)

2 Sheets—Sheet 2.

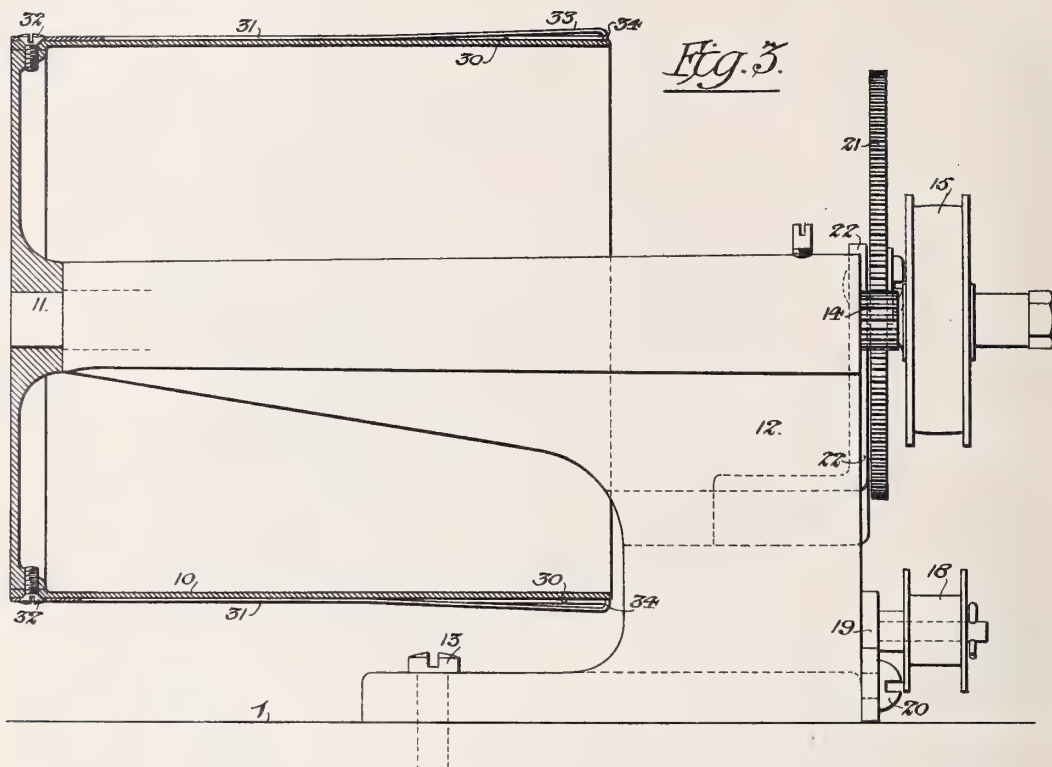


Fig. 5.

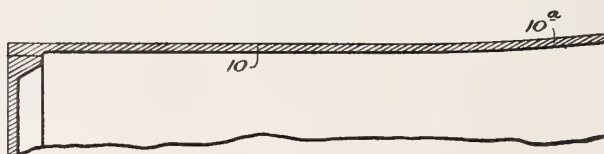
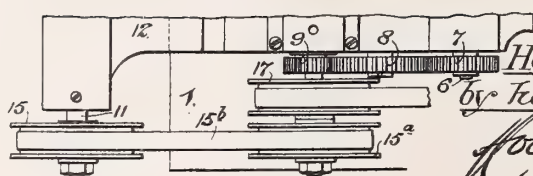


Fig. 6.



Witnesses:-

Louis L. Whitehead.

L. E. Beckhold

Inventor:-

Horace Sheble.

by his Attorneys:-

Howell Howson

UNITED STATES PATENT OFFICE.

HORACE SHEBLE, OF PHILADELPHIA, PENNSYLVANIA.

ATTACHMENT FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 654,493, dated July 24, 1900.

Application filed December 11, 1899. Serial No. 739,941. (No model.)

To all whom it may concern:

Be it known that I, HORACE SHEBLE, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented an Attachment for Phonographs or Graphophones, of which the following is a specification.

The object of my invention is to provide a simple form of attachment whereby an ordinary phonograph or graphophone instrument intended for using record-cylinders of small diameter may be readily adapted for the use of the modern and more desirable record-cylinders of large diameter. This object I attain in the manner hereinafter set forth, reference being had to the accompanying drawings, in which—

Figure 1 is a perspective view of an ordinary phonograph or graphophone instrument to which my attachment has been applied. Fig. 2 is a view of the same, partly in transverse section and partly in end elevation and on a larger scale. Fig. 3 is a view of the attachment, partly in side elevation and partly in longitudinal section. Fig. 4 is a sectional view of one of the elements of the attachment. Fig. 5 is a view illustrating a modified form of record-holder which may be used, and Fig. 6 is a top or plan view illustrating a modification of the driving device.

The record for use in an ordinary phonograph or graphophone instrument is formed upon a wax cylinder about two inches in diameter; but it has been found that much better results in reproduction are attained if the record-cylinder is of larger diameter, and special forms of phonograph or graphophone instruments are made for the purpose of using such large record-cylinders. These machines are, however, expensive; and the object of my invention is to provide an attachment which can be applied to an ordinary phonograph or graphophone instrument and which will render it available for using such large records, thus permitting the owners of the present instruments to obtain at a small cost all of the advantages of the larger and more expensive instruments.

The attachment consists, mainly, of a supplementary holder for the large record, an extension-tube for the support of the reproducer, and means for rotating the supple-

mentary record-holder at the desired speed, and also, by preference, gearing for connecting the shaft or spindle of said record-holder with the screw-shaft, which effects the longitudinal traversing movement of the reproducer.

In the drawings, 1 represents the motor-box of an ordinary phonograph or graphophone instrument; 2, the cylindrical record-holder; 3, the reproducer; 4, the carriage whereby the longitudinal traversing movement of the reproducer is effected; 5, the horn or trumpet; 6, the end of the screw-shaft which moves said carriage, and 7, 8, and 9 intermeshing spur-wheels, whereby said screw-shaft is connected to the shaft which carries the record-holder 2, the said shaft being provided with a pulley 17, which usually receives a belt running from a pulley forming part of the power mechanism in the box 1.

The supplementary or enlarged record-holder forming part of my attachment is represented at 10 and consists of a cylinder secured to and rotating with a shaft 11, which is adapted to turn in a bearing in a bracket 12, the latter being secured to the base-plate of the phonograph or graphophone instrument by a screw 13, which may be adapted to the threaded opening usually formed in said base-plate for the reception of a rail-supporting stem or standard, so that no special preparation of the machine for the reception of my attachment is rendered necessary. The shaft 11 has secured to it a spur-pinion 14 and a pulley 15, the latter receiving a belt 16 from the pulley forming part of the driving mechanism in the box 1, said belt passing over an idler-pulley 18, carried by a slotted bar 19, which can be adjusted so as to properly tighten the belt 16 and after adjustment can be secured to the bracket 12 by means of a clamp-screw 20. The spur-pinion 14 meshes with a spur-wheel 21, which is mounted so as to be free to turn on a stud carried by a secondary bracket 22, secured to and projecting from the main bracket 12 of the attachment, said spur-wheel 21 meshing with the spur-pinion 9 on the shaft of the record-holder 2.

If desired, the pulley 15 may be dispensed with and the ordinary driving-belt adapted to

the pulley 17 can be used; but I find that better results are attained if the driving-belt is adapted to a pulley on the shaft of the cylinder 10, so as to apply the power thereto directly instead of through the medium of the gears 14 and 21.

The gears 14 and 21 may be dispensed with in some cases by providing the shaft of the ordinary record-holder 2 with a second pulley 15^a and running a belt 15^b therefrom to the pulley 15, as shown, for instance, in Fig. 7; but this construction does not provide the desired positive driving connection between the feed-screw 6 and the shaft of the supplementary record-holder. Hence the use of the gears is always to be preferred.

In order to support the reproducer 3 in its proper relation to the enlarged record on the holder 10, I employ an extension-tube 23, which is inserted between the reproducer and the carriage 4, said tube having at its lower end a pin 24 for engagement with the slotted tube on the carriage, which ordinarily receives the reproducer, and at its upper end having slots 25 for engagement with the transverse pin 26 on the reproducer 3. All that is necessary therefore in order to convert the ordinary phonograph or graphophone into one capable of using large records is to secure the bracket 12 in place by means of the screw 13, remove the ordinary driving-belt and apply the belt 16, and insert the tube 23 between the reproducer and its carriage.

If desired, a reproducer or a carriage having a long tube may be used instead of the supplementary tube 23; but this would necessitate a change in the construction of the ordinary instrument. Hence the use of the supplementary tube will in most cases be resorted to. The use of the long tube gives to the reproducer the added weight desirable in order to secure the best results in reproduction from the large record.

The record-holder 10 of my attachment instead of being tapered externally from end to end, as usual, is cylindrical externally and has a series of longitudinal grooves 30—four in the present instance—each of said grooves receiving a spring-bar 31, which is secured to the cylinder at one end by means of a set-screw 32 and is bent at the other end, so as to form a flaring tongue 33 for engagement with the tapering interior of the wax cylinder which carries the record, the tongue being bent down at the end, as shown at 34, so as to bear upon the cylinder 10. This construction is not absolutely necessary, however, as the cylinder itself may be flared at the inner end, as shown, for instance, at 10^a in Fig. 5. Either of these constructions provides a rigid bearing at one end of the cylinder for the large end of the tapered bore of the record and a rigid bearing at the other end of the cylinder for the contracted end of said tapered bore of the record, thereby overcoming the objection of uncertainty of concentric

support for the record, which results when yielding spring-holders on the cylinder are employed.

Instead of using a continuous cylinder a skeleton cylinder or a series of fingers projecting from the head, which is secured to the shaft 11, may be employed in some cases, so as to lessen the weight of the supplementary record-holder, and thereby decrease the amount of power necessary to rotate it.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. A phonograph or graphophone attachment consisting of a record-holder independent of the ordinary record-holder of the instrument, a bearing in which said supplementary record-holder is free to rotate, means for rotating it and provision for mounting the reproducer in proper relation to it, substantially as specified.

2. An attachment for phonographs or graphophones comprising a record-holder supplementary to the ordinary record-holder, means for rotating the same, and a detachable extension-tube interposed between the reproducer and the reproducer-carriage, substantially as specified.

3. A phonograph or graphophone attachment comprising a record-holder supplementary to the ordinary record-holder, a bearing therefor, means for rotating said supplementary record-holder, gearing connecting the shaft of the same with the feed-screw for the reproducer-carriage, and provision for mounting the reproducer in proper relation to said supplementary record-holder, substantially as specified.

4. An attachment for phonographs or graphophones comprising a record-holder supplementary to the ordinary record-holder, a bearing therefor, a pulley on the shaft of said supplementary record-holder, an idler-pulley for the support of the driving-belt, a slotted bar carrying said idler-pulley and adjustable in order to slacken or tighten the belt, and provision for mounting the reproducer in proper relation to the supplementary record-holder, substantially as specified.

5. An attachment for phonographs or graphophones comprising a supplementary record-holder, means for mounting and rotating the same, and an extension-tube interposed between the reproducer and the reproducer-carriage, said tube having a pin at one end for engagement with the slotted reproducer-tube of the carriage, and slots at the other end for engagement with the pin of the reproducer, substantially as specified.

6. A record-holder for phonographs or graphophones, cylindrical throughout the greater portion of its length and adapted to fit the contracted end of the tapering bore of the record, said cylinder having at one end an outwardly-flaring portion or portions with gradual increase in diameter for engagement

with the enlarged end of the tapering bore of the record whereby said record is rigidly supported at each end, substantially as specified.

5 7. A record-holder for phonographs or graphophones consisting of a cylinder adapted to fit the contracted end of the tapering bore of the record and having a series of bars flared outwardly at one end of the cylinder
10 but having a rigid bearing upon the latter and adapted to fit the enlarged end of the

tapering bore of the record, whereby said record is rigidly supported at each end, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 15

HORACE SHEBLE.

Witnesses:

F. E. BECHTOLD,
JOS. H. KLEIN.

No. 654,778.

Patented July 31, 1900.

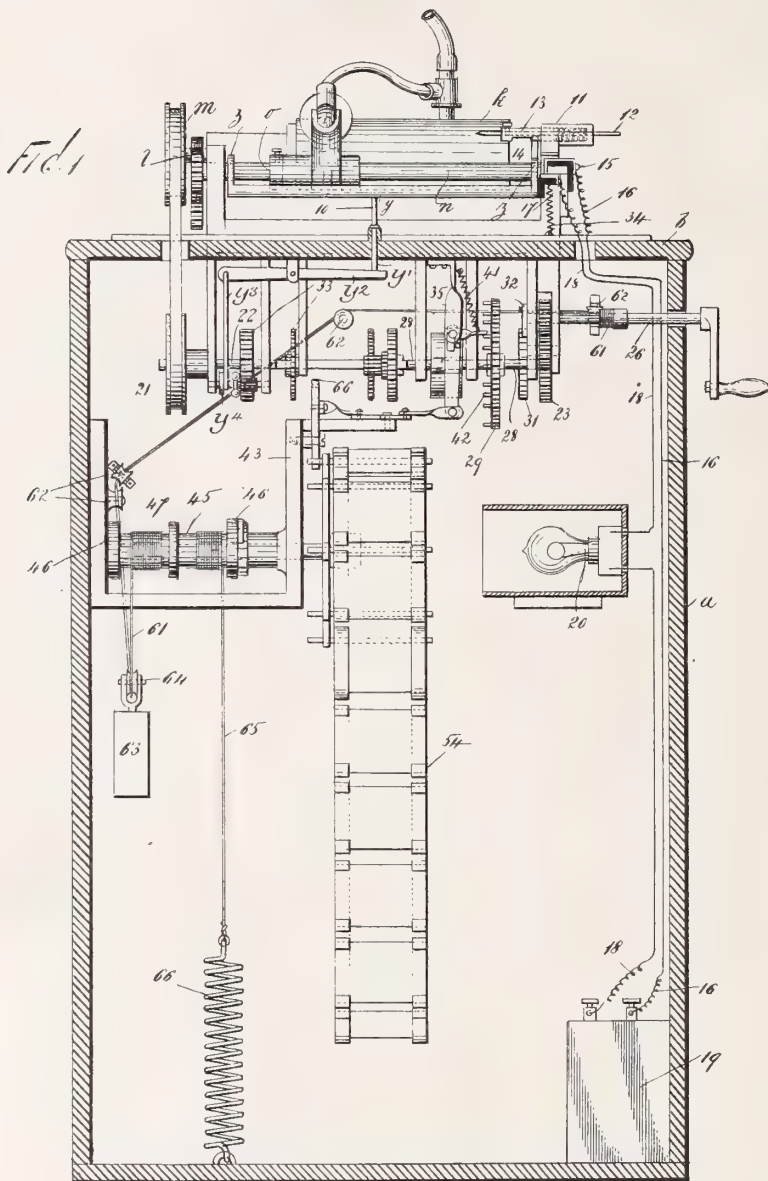
G. W. BOSCHEN.

PANORAMIC ATTACHMENT FOR PHONOGRAPHS.

(Application filed Apr. 25, 1899.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES

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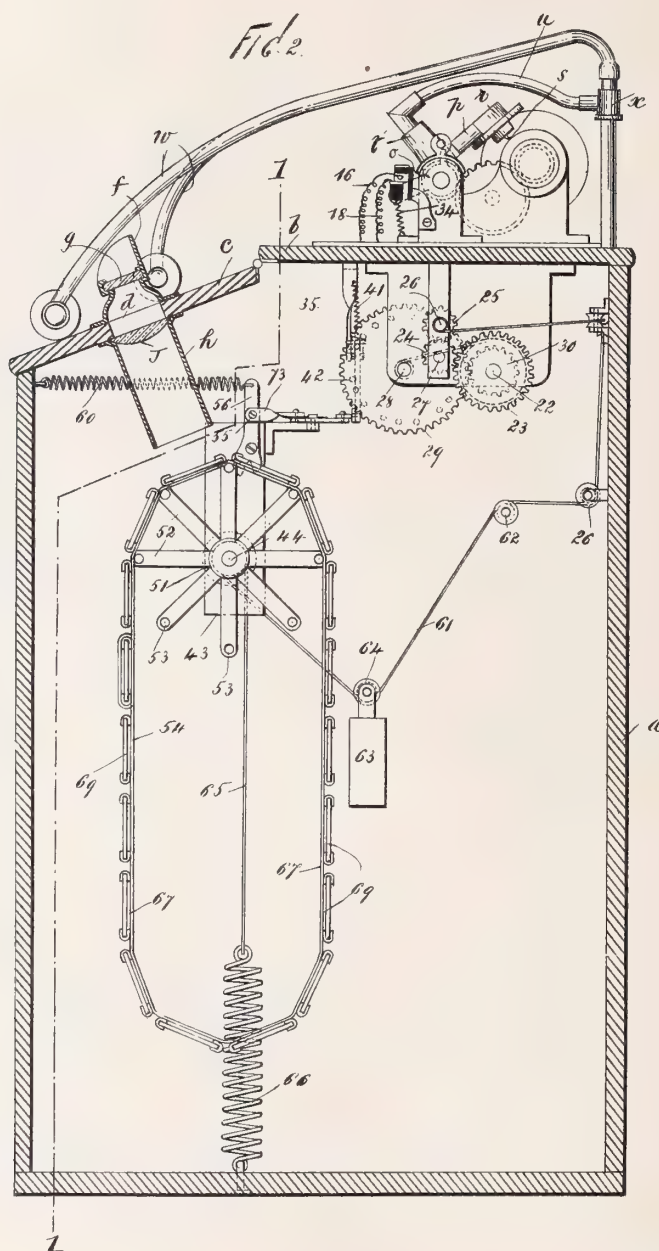
G. W. BOSCHEN.

PANORAMIC ATTACHMENT FOR PHONOGRAPHS.

(Application filed Apr. 25, 1899.)

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5 Sheets—Sheet 2.



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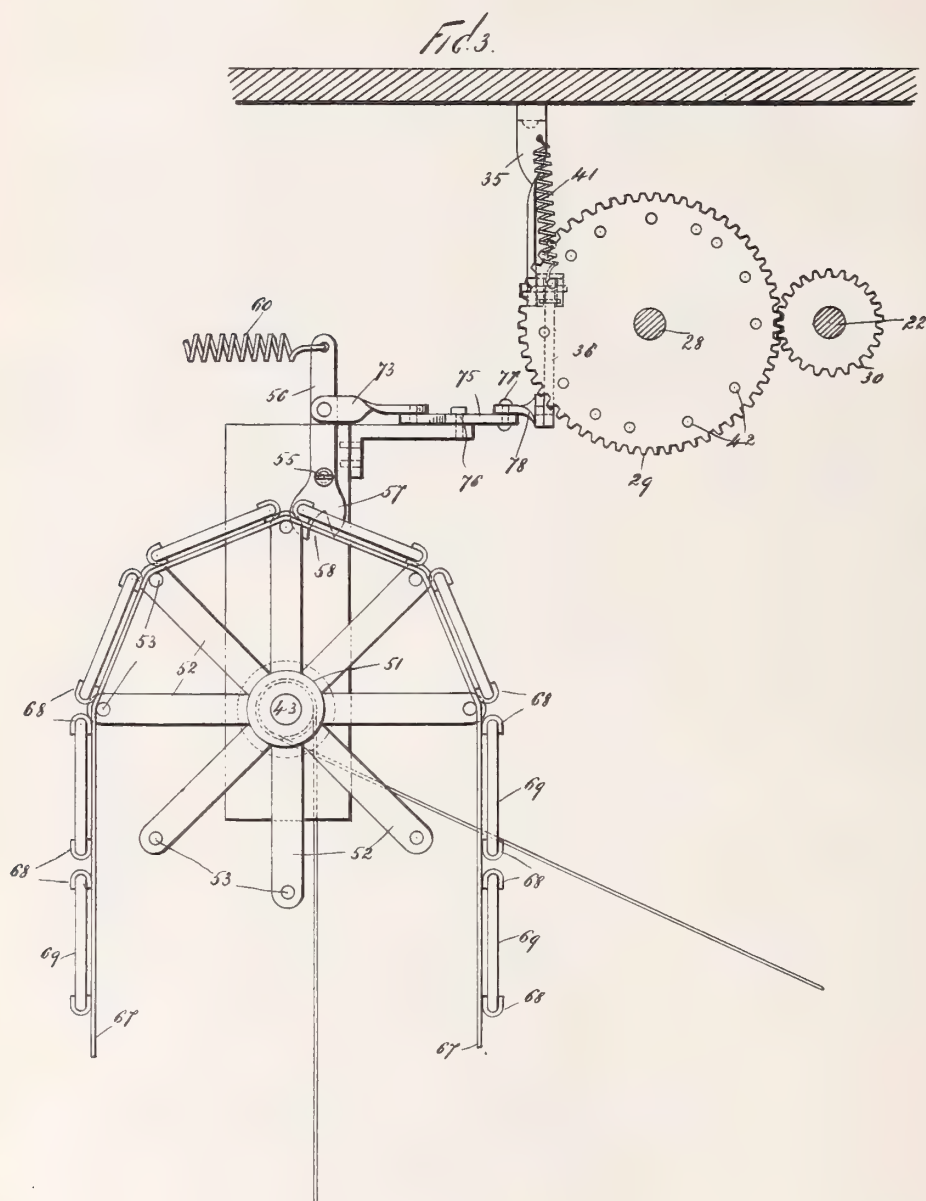
G. W. BOSCHEN.

PANORAMIC ATTACHMENT FOR PHONOGRAPHS.

(Application filed Apr. 25, 1899.)

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5 Sheets—Sheet 3.



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(Application filed Apr. 25, 1899.)

(No Model.)

5 Sheets—Sheet 4.

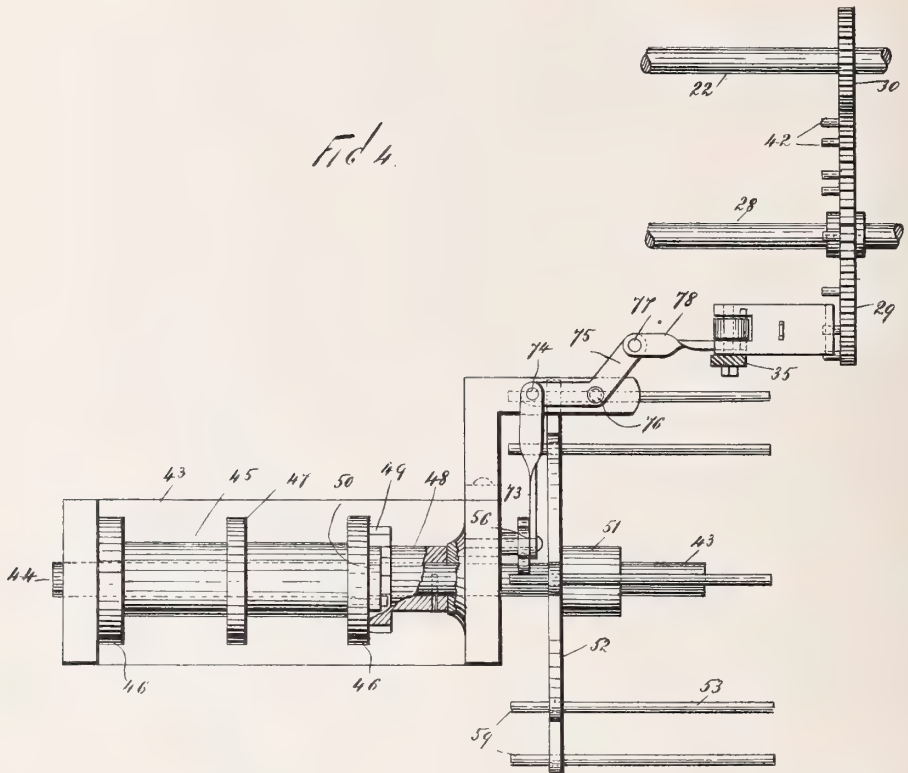


Fig. 5.

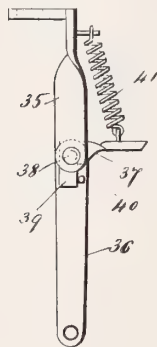
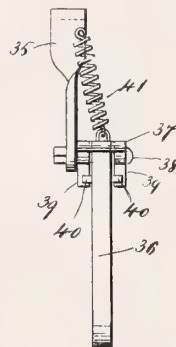


Fig. 6.



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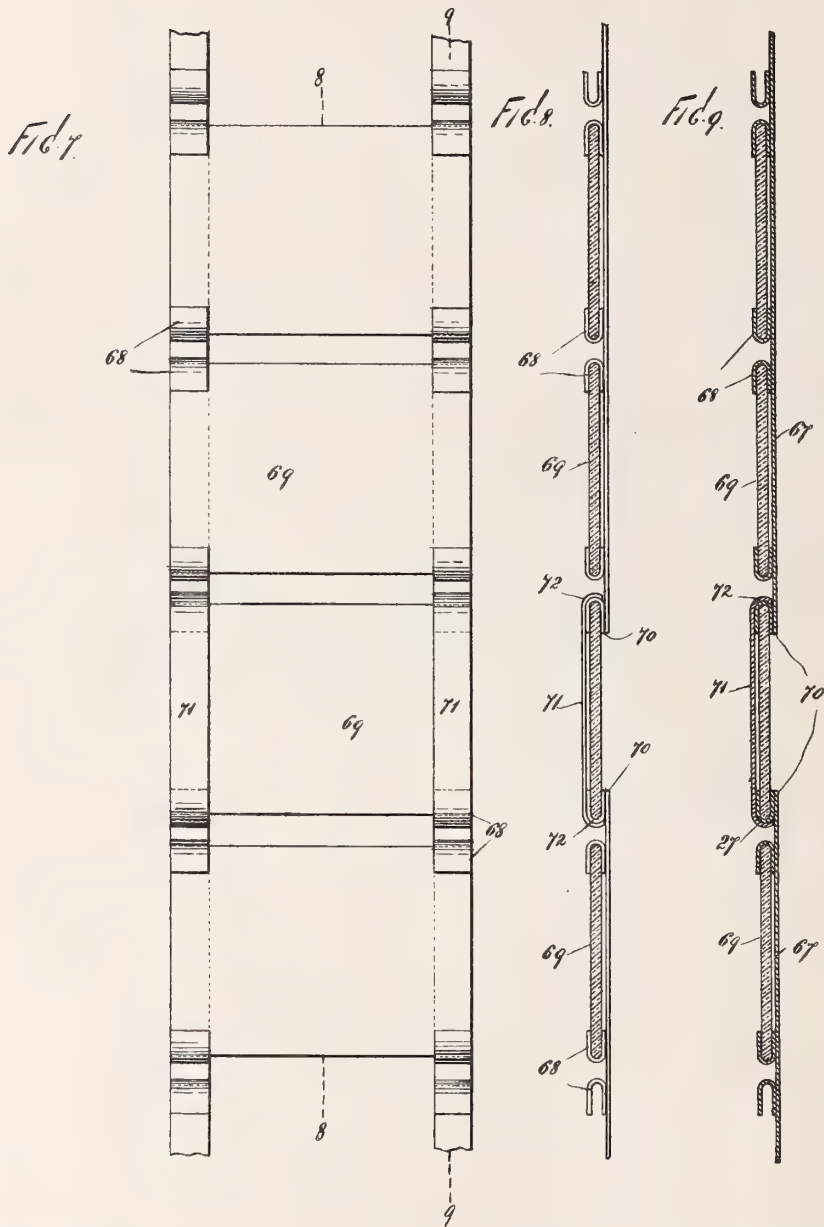
G. W. BOSCHEN.

PANORAMIC ATTACHMENT FOR PHONOGRAPHS.

(Application filed Apr. 25, 1899.)

(No Model.)

5 Sheets—Sheet 5.



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UNITED STATES PATENT OFFICE.

GUSTAVE WOLF BOSCHEN, OF RAHWAY, NEW JERSEY, ASSIGNOR OF ONE-HALF TO PHILIP HILDEBRANDT, OF HOBOKEN, NEW JERSEY.

PANORAMIC ATTACHMENT FOR PHONOGRAPHS.

SPECIFICATION forming part of Letters Patent No. 654,778, dated July 31, 1900.

Application filed April 25, 1899. Serial No. 714,349. (No model.)

To all whom it may concern:

Be it known that I, GUSTAVE WOLF BOSCHEN, a citizen of the United States, residing at Rahway, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Panoramic Attachments for Phonographs, of which the following is a full and complete specification, such as will enable those skilled in the art to which it appertains to make and use the same.

This invention relates to phonographs; and the object thereof is to provide an improved panoramic attachment for a phonograph by means of which a song, speech, or story may be illustrated by a series of pictures which are successively exhibited during the delivery of the song, speech, or story by the phonograph, a further object being to provide an attachment of the class described in which the arrangement of the pictures and the operative mechanism are such as to illustrate topics, parts, or subjects of the song, speech, or story at the exact moment of the reference thereto by the phonograph.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which—

Figure 1 is a front view of the apparatus and casing therefor which I employ, the casing being shown in section, taken on the line 1 1 of Fig. 2; Fig. 2, a side view of said apparatus, the casing being in section; Fig. 3, a view similar to Fig. 2 with the casing removed and showing parts of the apparatus on an enlarged scale; Fig. 4, a plan view of a part of the apparatus on an enlarged scale; Figs. 5 and 6, front and side views, respectively, of details of the apparatus; Fig. 7, a plan view of an endless belt which carries the picture-slides; and Figs. 8 and 9, sections on the lines 8 8 and 9 9, respectively, of Fig. 7.

In the drawings forming part of this specification the separate parts of my improvement are designated by the same letters and numerals of reference, and in the practice of my invention I provide a casing *a*, provided with a top composed of two parts *b* and *c*. The part *b* of the top is horizontal, and the part *c* is hinged thereto and preferably downwardly inclined, as shown in Fig. 2, and the

said part *c* of the top is provided centrally with a sight-opening *d*, which is closed on the upper side of said top portion *c* by a sight-tube *f*, in which is placed a glass *g*, and the sight-opening *d* is closed on the lower side by an inwardly-directed tube *h*, in which is placed a plano-convex lens *J*.

Mounted on the horizontal portion *b* of the casing *a* is a suitable frame or support, in which is mounted the blank cylinder *k* of the phonograph. The said blank cylinder is provided with a shaft *l*, on one end of which is a pulley *m*. A longitudinal slotted tube *n* is mounted in front of the record-cylinder *k* and provided with a carriage comprising a sleeve *o*, having a backwardly-directed arm *p*, which carries the reproducer *r*, which is provided with the usual stylus *s*, which operates in connection with the record-cylinder *k* in the usual manner, and the sleeve *o* is also provided with a forwardly and upwardly directed tubular extension *t*, with which the usual delivery-tube is connected, and the flexible ear-tubes *w* are placed in connection with the tube *u* at *x*. Mounted in front of the guide-shaft *n* is a longitudinal bar *y*, provided at each end with arms *z*, through which the shaft *n* passes, and the bar *y* is free to turn on the shaft *n* and is in operative connection at 10 with the vertical lever *y'*, mounted in the top of the phonograph and connected with a horizontal lever *y''*, pivoted beneath said phonograph top, which connects by means of a pitman *y'''* with an eccentric *y''''*, mounted upon a portion of the phonograph-gearing. At the end of the blank cylinder *k*, opposite the pulley *m*, is a longitudinal tubular support 11, in which is mounted a spring-operated pin 12, which passes through a sleeve 13, which is secured to said pin, and the arm *z* of the bar *y*, at the end thereof adjacent to the tubular support 11, is provided with a projection 14, which is adapted to make contact with the sleeve 13 and to be released therefrom by the carriage on the shaft *n* in the operation of the device, as hereinafter described.

The end of the support or frame in which the blank cylinder *k* is mounted is provided adjacent to the tubular support or bearing 11 with a stationary binding-screw 15, with which

is connected a wire 16, and the corresponding end of the bar *y* is provided with a binding-screw 17, with which is connected a wire 18, and the binding-screws 15 and 17 are insulated from their supports. A battery 19 is placed in the bottom of the casing *a*, and the wires 16 and 18 are in connection therewith and with an ordinary incandescent electric light 20.

10 The pulley *m* on the end of the shaft *l* of the blank cylinder *k* is geared in connection with a corresponding pulley 21 on a shaft 22, supported beneath the portion *b* of the top of the casing by suitable hangers in the usual manner. The said shaft 22 is provided at the
15 end thereof opposite the pulley 21 with a gear-wheel 23, and this gear-wheel 23 operates in connection with a pinion 24, which operates in connection with a pinion 25 on the crank-shaft 26. The pinion 24 is mounted on a short shaft 27, supported in front of the gear-wheel 23, and in front of the shaft 22 is a supplemental shaft 28, on which is mounted a large gear-wheel 29, which operates in
20 connection with a small gear-wheel 30, mounted on the shaft 22. I have also shown a ratchet-wheel 31 mounted on the shaft 22, and a pawl 32, which operates in connection therewith, and said shaft 22 is also provided
25 with other gears, pinions, &c., as shown at 33, which are usually employed in connection with and form part of the operative mechanism of the phonograph, but which form no part of this invention.

35 All the operative parts of the phonograph hereinbefore described, with the exception of the electric wires or circuits 16 and 18 and the binding-screws 15 and 17, the electric light 20, the battery 19, the supplemental
40 shaft 28, the gear-wheel 29, and the parts by which said gear-wheel is operated, are also all of the usual construction—such, for example, as is shown in Letters Patent No. 582,754, issued May 18, 1897, to Thomas H. MacDonald—
45 and form no part of this invention.

The bar *y* is also provided at one end with a spring 34 for holding it in its normal position. Suspended beneath the part *b* of the top of the casing *a*, in proximity to the wheel
50 29 and at the left thereof, as shown in Fig. 1, is a hanger 35, which is shown detached in Figs. 5 and 6 and to the lower end of which is pivoted a lever 36. A pawl 37 is also pivotally mounted on a pivot-pin 38, by which
55 the lever 36 is connected with the hanger 35, and said pawl is provided with two downwardly-directed side lugs or projections 39, which operate in connection with pins 40, secured to or formed on the lever 36, and a
60 spring 41 connects the pawl 37 with the upper end of the hanger 35. The gear-wheel 29 is provided on the side thereof adjacent to the hanger 35 with a plurality of pins 42, which are arranged in a circle according to a system
65 hereinafter described, and these pins operate in connection with the pawl 37.

Arranged transversely of the casing *a*, in

front of and below the shaft 28, is a yoke-shaped frame or support 43, in which is mounted a shaft 44, and mounted loosely on
70 said shaft, within said frame or support, is a drum 45, provided at each end with a flange 46 and at the center thereof with a corresponding annular flange 47, and keyed to said shaft, within said frame or support and adjacent to the inner end of said drum and support, is a hub 48, provided with a ratchet-wheel 49, and the drum 45 is provided adjacent to said ratchet-wheel with a pawl 50, which operates in connection with said
80 ratchet-wheel. The shaft 44 projects inwardly through the end of the yoke-shaped frame or support 43, and mounted thereon and secured thereto is a hub 51, provided with radial arms 52, which carry pins 53, arranged in a circle and constituting a drum, on which is placed an endless belt 54. Pivotally connected with the inner end of the yoke-shaped frame or support 43 at 55 is a tripper
90 56, which is provided at its lower end with an elliptical head 57, in the bottom of which is formed a triangular notch or recess 58, one of the side jaws of which is slightly longer than the other, and in the normal position of the tripper 56 the convex side of the longer jaw of the head 57 rests against the projected end
95 of one of the pins 53, as shown in Fig. 3. The pins 53 are each projected through the radial arms 52, as shown at 59 in Fig. 4, in order that the head 57 of the tripper 56 may operate thereon, and the upper end of the tripper 56 is connected with the front of the casing *a* by a spiral spring 60. The drum 45 is free to turn in one direction on the shaft 44, but cannot turn in the opposite direction
105 without turning said shaft and the hub 48, and the drum on which the endless belt 54 is mounted and consisting of the hub 51, the radial arms 52, and the pins 53 also turn with said shaft. A cord 61 is wound on the drum 45 between the central flange 47 and the left-hand end flange or rim 46, and said cord 61 is passed over and around suitably-supported pulley-wheels 62 and connected with the crank-shaft 26, and mounted on said cord between the drum 45 and the adjacent pulley
110 wheel 62 is a sliding or movable weight 63, which is provided with a pulley 64, around which said cord is passed. Another cord 65 is connected with and wound on the drum 45 between the central flange or rim 47 and the right-hand end flange or rim 46, and this cord is connected with a strong contractile spring 66, secured to the bottom of the casing *a*. The cords 61 and 65 are wound on the drum 45 in
120 opposite directions, and when the crank-shaft 26 is turned to the right in order to wind up the phonograph the cord 61 is unwound from the drum 45 and the cord 65 is wound thereon against the operation of the spring 66, and when the device is wound up the tendency of the spring 66 is to continuously unwind the drum 45.

The endless belt 54, mounted on the pins

53, connected with the radial arms 52 of the hub 51, is composed of separate flexible strips or bands 67, with the outer sides of which are connected U-shaped holders 68, which are adapted to receive and hold transparent slides 69, on which the pictures are placed, and the strips or bands 67 are divided at 70, as shown in Figs. 8 and 9, and the ends thereof connected by short flexible metal strips 71, provided with hook-shaped portions 72 at their opposite ends, which engage with the U-shaped holders 68, as clearly shown in Figs. 8 and 9, and the object of this construction is to provide means to shorten the endless belt whenever necessary or desirable.

Connected with the tripper 56, between the upper end thereof and its pivotal support at 55, is a link 73, which is pivotally connected at 74 with a crank-lever 75, which is pivotally supported at 76 and also pivotally connected at 77 with a link 78, which is pivotally connected with the lower end of the link 36, as clearly shown in Figs. 1, 2, 3, and 4.

The pictures are placed on the slides 69 in the usual manner, and the arrangement of the pins 42 on the gear-wheel 29 will depend entirely upon the topic, part, or subject of the song, speech, or story which it is desired to illustrate as the song, speech, or story is being delivered by the phonograph.

In practice the device is wound up in the usual manner, and the endless belt 54, which carries the picture-slides 69, is placed on the pins 53 to correspond with the arrangement of the pins 42 on the wheel 29, and as the song, speech, or story is delivered by the phonograph the endless belt 54 is turned by the shaft 45 so as to present one of the pictures at the desired time. In this operation as the wheel 29 revolves one of the pins 42 strikes the end of the pawl 37 and forces it upwardly. This operation forces the lower end of the link 36 to the right and correspondingly operates the crank-lever 75, which results in pulling the upper end of the tripper 56 to the right and causes the longer jaw of the tripper-head 57 to move over the corresponding pin 53, against which it normally rests, as shown in Fig. 3. In this operation the drum on which the endless belt 54 is mounted moves slightly to the left of the position shown in Fig. 3 and then moves through the space to the right, thus bringing a picture squarely under the lens-tube *h*, and in this operation the pin 53 strikes the shorter jaw of the tripper-head 57 and slides over the same, and thus the movement of the endless belt is slightly retarded and prevented from being too quick or sudden, it being understood that the spring 66 constantly tends to turn the drum on which the endless belt is mounted to the right when viewed as in Fig. 3. It will be understood that as the delivery of the song, speech, or story by the phonograph proceeds the wheel 29 is constantly turned and at the proper time the pins 42 are brought into connection with the pawl

37 and the endless belt 54 is correspondingly turned. As the machine is wound up, as hereinbefore described, and as is customary in this class of devices, the bar *y* is correspondingly raised until the projection 14 of the arm *z* thereof comes in connection with the sleeve 13, and in this position the said bar *y* is held until the sleeve *o* or the parts connected therewith strike the inner end of the pin 12. This forces the said pin outwardly and disconnects the projection 14 from the sleeve 13, and the bar *y* drops downwardly into its normal position. All these parts are of the usual construction and operation and are not therefore more clearly shown in detail. When the bar *y* is raised and the phonograph is in operation, the supports of the wires 16 and 18 at 15 and 17 are in electrical connection, and the circuit is established through the electric light 20, and the endless belt 54 is properly illuminated; but as soon as the operation of the phonograph is completed and the bar *y* drops downwardly the electrical connection of the wires 16 and 18 at 15 and 17 is broken, as will be readily understood, and the light 20 will not be in operation.

As the result of the construction herein described it will be seen that the endless belt 54 is intermittently revolved, and the time between each movement will depend upon the arrangement of the pins 42 on the wheel 29, and this arrangement of the pins 42 depends upon the parts or topics of the song, speech, or story which it is desired to illustrate, and said arrangement is such that the observer will have time to examine the pictures through the sight-opening *d* in the hinged portion *c* of the top of the casing *a*. It will also be observed that for each song, speech, or story a new arrangement of the pins 42 must be provided, together with new pictures for the slide 69 of the endless belt.

The entire apparatus is simple in construction and operation and perfectly adapted to accomplish the result for which it is intended, and it will be apparent that changes in and modifications of the construction described may be made without departing from the spirit of my invention or sacrificing its advantages.

Having fully described my invention, I claim as new and desire to secure by Letters Patent—

1. A device of the class described, comprising the combination, with a phonograph, of a plurality or series of pictures, mechanism for displaying said pictures, and means connected with the said phonograph and with the picture-displaying mechanism whereby the operation of the phonograph actuates the displaying mechanism to display the pictures at irregular predetermined intervals, corresponding to the vocal matter of the phonograph which said pictures are to illustrate, substantially as shown and described.

2. A device of the class described, comprising a phonograph in which is embodied a gear-

wheel or part rotating in unison with the sound-producing cylinder, a plurality or series of pictures mounted relatively to said phonograph, mechanism for displaying the said pictures, and means upon the gear-wheel or moving part of the phonograph whereby the displaying mechanism may be actuated at irregular predetermined intervals, substantially as shown and described.

3. A device of the class described, comprising a phonograph in which is embodied a part rotating in unison with the sound-producing cylinder, a picture - displaying mechanism mounted relatively to said phonograph, and provided with means for causing the same to turn, means for holding said displaying mechanism in a stationary position, and means upon said gear-wheel or moving part of the phonograph for tripping or throwing off the said holding means, whereby the pictures may be displayed at predetermined intervals, substantially as shown and described.

4. In a device of the class described, a casing, a phonograph mounted thereon, a gear-wheel in operative connection with the operative parts of the phonograph and provided with a plurality of pins arranged at irregular intervals in a predetermined order on one side thereof, an endless belt revolubly mounted in said casing and provided with a plurality of picture - slides, devices exerting a constant tendency to turn said belt in one direction, and devices in operative connection with said gear-wheel for giving said belt a series of movements at irregular predetermined intervals, substantially as shown and described.

5. In a device of the class described, a casing, a phonograph mounted thereon, a shaft mounted in said casing, a drum mounted on said shaft, two cords connected with and wound on said drum in opposite directions, one of which is connected with the winding-shaft of the phonograph, a contractile spring connected with the other cord and exerting a constant tendency to revolve said shaft in one direction, an endless-belt support connected with said shaft, an endless belt mounted thereon and provided with picture-slides, a gear-wheel in connection with the operative mechanism of the phonograph, and devices in connection with said gear-wheel for permitting said endless-belt support to move intermittently, substantially as shown and described.

6. In a device of the class described, a casing, a phonograph mounted thereon, an endless belt supported within said casing and provided with picture-slides, means for turning the support of said belt constantly in one direction, a gear-wheel in connection with the operative mechanism of the phonograph, and devices in operative connection with said gear-wheel for permitting said endless belt to move intermittently, consisting of pins arranged in a circle on said gear-wheel, a pawl operated by said pins, a link operated by said pawl, a crank operated by said link, and a

tripper operated by said crank, and operating in connection with the support of said endless belt, substantially as shown and described.

7. In a device of the class described, a casing, a phonograph mounted thereon, a gear-wheel in connection with the operative mechanism of the phonograph, an endless belt mounted on a support within said casing, devices exerting a constant tendency to turn said support in one direction, other devices in connection with said gear-wheel for permitting the support of the endless belt to move intermittently, and an electric light within said casing, said light being in a circuit which is opened and closed by the operative mechanism of the phonograph, substantially as shown and described.

8. In a device of the class described, a casing, a phonograph mounted thereon, an endless belt mounted on a support within said casing and provided with picture-slides, a shaft on which the support of the endless belt is mounted, a drum mounted on said shaft and adapted to turn freely in one direction and to turn said shaft in the opposite direction, a cord wound on said drum, a spiral spring connected with said cord and operating to turn said drum in the direction to turn said shaft, another cord wound on said drum, and adapted to turn the same in the opposite direction, said last-named cord being connected with the crank-shaft of the phonograph, a gear-wheel in connection with the operative mechanism of the phonograph, and devices connected with said gear-wheel for permitting the support of the endless belt to move intermittently, substantially as shown and described.

9. In a device of the class described, a casing, a phonograph mounted thereon, the operative mechanism of which is partly within said casing, an endless-belt support mounted in said casing, an endless belt mounted thereon and provided with picture-slides, devices exerting a constant tendency to turn the support of said belt in one direction, other devices in connection with the operative mechanism of the phonograph for permitting said support to move intermittently, and an electric light mounted in said casing and in a circuit which is closed and opened by the operative mechanism of the phonograph, substantially as shown and described.

10. In a device of the class described, a casing provided with a phonograph which is mounted thereon, and the operative mechanism of which is partly within said casing, said casing being also provided with a hinged top portion having a sight-opening, tubes inclosing said opening and provided with a sight-glass and a lens, an endless-belt support mounted within said casing, an endless belt mounted thereon and provided with picture-slides, devices exerting a constant tendency to turn the support of said belt in one direc-

tion, and other devices in connection with the operative mechanism of the phonograph for permitting said support to move intermittently, said casing being also provided with
5 an electric light in a circuit which is adapted to be opened and closed by the operative mechanism of the phonograph, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of the subscribing witnesses, this 24th day of April, 1899.

GUSTAVE WOLF BOSCHEN.

Witnesses:

RAYMOND J. BLAKESLIE,
F. A. STEWART.

No. 654,937.

Patented July 31, 1900.

J. N. BLACKMAN.
PHONOGRAPH ATTACHMENT.

(Application filed Mar. 26, 1900.)

(No Model.)

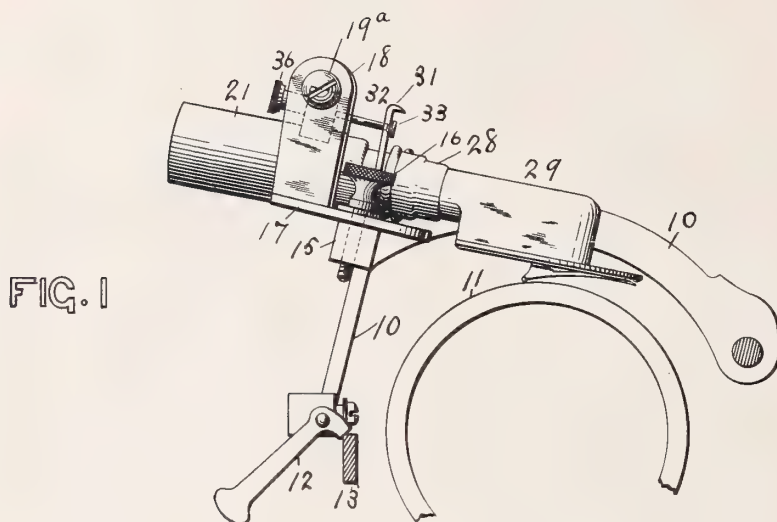


FIG. 1

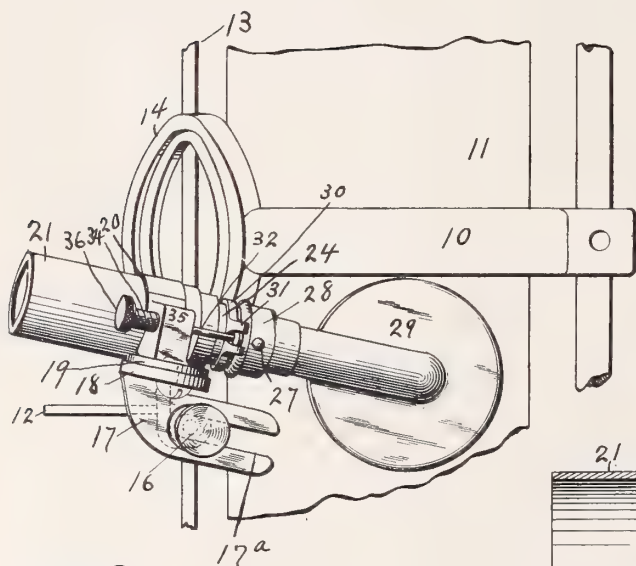


FIG. 2

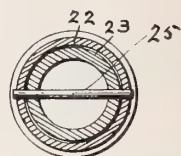


FIG. 4

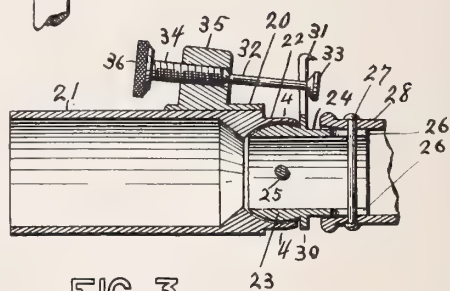


FIG. 3

WITNESSES:

Arthur G. Linders
Patrick J. Rooney

INVENTOR

Joseph Newcomb Blackman

BY

W. B. Hutchinson,
ATTORNEY

UNITED STATES PATENT OFFICE.

JOSEPH NEWCOMB BLACKMAN, OF EAST ORANGE, NEW JERSEY.

PHONOGRAPH ATTACHMENT.

SPECIFICATION forming part of Letters Patent No. 654,937, dated July 31, 1900.

Application filed March 26, 1900. Serial No. 10,121. (No model.)

To all whom it may concern.

Be it known that I, JOSEPH NEWCOMB BLACKMAN, of the city of East Orange, county of Essex, and State of New Jersey, have invented a certain new and useful Improvement in Attachments for Phonographs or Graphophones, of which the following is a full, clear, and exact description.

My invention relates to improvements in an attachment for phonographs, graphophones, or similar instruments. It sometimes happens, for instance, that a party having an Edison type of machine on which he is using an Edison reproducer will wish to use a recorder of another make in connection with the machine. At present, so far as I know, it is necessary in such case to remove a portion of the machine—to wit, the arm carrying the speaker or reproducer—and attach in lieu thereof the arm carrying the other type of recorder.

The objects of my invention are to produce a simple attachment which can be attached to the arm of one type of machine, to which attachment a recorder of another style of machine can be attached, and to provide a convenient means of adjustment, so that the recorder can be instantly placed in position to perform its work on the cylinder or can be as easily thrown out of position. My intention is to provide a very simple and convenient device of this kind which can, if desired, be left on the machine, so that the machine can be used at will either as a recorder or reproducer, so that either type of recorder can be used, and, further, to construct the device so that it can be easily applied or removed and can be very nicely and quickly adjusted to meet the requirements of such machines.

To these ends my invention consists of certain features of construction and combinations of parts, which will be hereinafter described and claimed.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar figures of reference refer to similar parts throughout the several views.

Figure 1 is a side elevation of my attachment, showing the same in position upon the arm of an Edison type of machine. Fig. 2 is a plan view of the attachment and parts

shown in Fig. 1. Fig. 3 is a detail longitudinal section through the main tube and the coupling and shows the means for adjusting the tube in one direction. Fig. 4 is a cross-section on the line 4 4 of Fig. 3.

In the drawings I have shown only enough of the ordinary type of machine to illustrate the use of my invention, and the drawings illustrate the ordinary arm 10 of the Edison machine, which extends from the cylinder 11, precisely as usual, and has the customary adjusting-lever 12 bearing on the rail 13 of the machine. The arm has the usual eye 14 to receive a reproducer and the lug 15 on one side of the eye. All this is usual and no novelty is claimed for it.

To the lug 15 is fastened by a binding-screw 16 the lower end portion 17 of a bracket, this part lying parallel with the plane of the lug 15, and the bracket-arm is forked, as shown at 17^a, to receive the binding-screw 16 and to permit the bracket to be adjusted back and forth in relation to the cylinder 11. The bracket also comprises an upright arm 18, which extends, essentially, at right angles to the plane of the arm 17, and to this is held the plate 19, the connection being by means of a screw 19^a, so that the plate 19 may be swung on the screw to bring it into the desired relation and then held in position by tightening the screw. The plate 19 is connected to the curved arm 20, which is secured to the main tube 21 of the device, this tube being adapted to connect with the ordinary trumpet or mouthpiece in the usual manner. The inner end of the tube 21 is reduced and internally curved, as shown at 22, so that it may receive the curved and thickened head or end 23 of the coupling 24, which is tubular, so that sound may pass readily through it, and is held to the tube 21 by a cross-pin 25, which thus permits the coupling and the recorder thereto connected to be moved up and down in relation to the tube 21 and to the cylinder 11. The inner end of the coupling 24 is slotted on opposite sides, as shown at 26, to receive the cross-pin 27 on the mouth 28 of the recorder 29. The pin 27 is at right angles to the pin 25, above referred to, so that while the coupling has a limited movement up and down the recorder can have a limited move-

ment laterally, and thus ample means is provided for adjustment and for the necessary freedom of movement.

I have not shown the recorder in detail, as it is of a well-known type and forms no part of this invention.

The coupling is provided with a flange 30, which extends around the coupling between the parts 22 and 28, and on this flange is a fork 31, which extends upward and which can of course be produced on the coupling without the intervention of a flange, and the fork receives the end 32 of an adjusting-screw 34, the head 33 of which engages the fork, while the body of the screw turns in the boss 35 on the plate or arm 20, above referred to. The screw 34 has for convenience a milled head 36, so that it can be turned readily by the thumb and finger. It will be seen, therefore, that as the plate 20 and boss 35 are fixed to the tube 21 the operator can by a simple turn of the screw 34 permit the recorder to drop down into contact with the cylinder 11, as shown in Fig. 1, or the screw may be drawn back, so as to act on the fork 31, tilt the coupling 24 on the pin 25, and lift the recorder out of contact with the cylinder. To place the recorder on the attachment, it is only necessary to push the part 28 upon the coupling, with the pin 27 engaging the slot 26 of the coupling. In using the instrument it is not, however, necessary to remove the recorder even when a reproducer is to be used, as by turning the screw 34, as stated, the recorder can be thrown out of use.

When once the attachment is adjusted, it is not necessary usually to make any further adjustment. The adjustment is first effected by pushing the part 17 of the bracket 17 18 the desired extent on the binding-screw 16 and then tightening the screw and also by adjusting the plate 19 20 by means of the screw 19^a, so as to bring the recorder, when attached, to the approximately-correct position. After this the required nicety of adjustment is effected by the screw 34, as already described.

It will of course be apparent on referring to the drawings and reading this specification that certain parts of the attachment may be changed or modified without affecting the principle of the invention. Of course the particular shape of the brackets and the construction in detail of the several parts are not material; but the essential features comprise mechanism for holding a recorder attachment on a reproducer or recorder arm and for properly adjusting the attachment.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. A device of the kind described comprising a bracket or support, a fastening device to secure the bracket to the usual phonograph-arm, a tube mounted on the bracket, and adjustable means for connecting one end of the tube to the mouth of a recorder substantially as described.

2. A device of the kind described, comprising a bracket or support, fastening means to secure the bracket to a phonograph-arm, a tube adjustably supported on the bracket, and adjustable means for connecting the tube with the mouth of the recorder.

3. A device of the kind described, comprising a tube, a coupling at one end thereof adapted to connect with a recorder, a screw mechanism for adjusting the coupling in relation to the tube, and means for supporting the tube on the arm of a phonograph.

4. A device of the kind described, comprising a tube, a connection adjustable up and down, by means of which the tube may be connected to a recorder, and adjustable means for supporting the tube on the arm of a phonograph.

5. A device of the kind described, comprising a tube having means for connecting with a recorder, a bracket adapted to support the tube on the arm of the phonograph, and a plate adjustable on one arm of the bracket, said plate carrying the aforesaid tube substantially as described.

6. In a device of the kind described, the combination of the tube and coupling adapted to connect with a recorder, means as the fork on the coupling and the screw on the tube for adjusting the tube and coupling in relation to each other, and means for supporting the tube on the arm of a phonograph, substantially as described.

7. A device of the kind described, comprising a tube, a vertically-adjustable connection between the tube and recorder, a supporting-bracket, means for adjusting the tube on said support, a detachable adjustable mechanism for retaining the bracket on the arm of a phonograph, substantially as described.

In testimony that I claim the foregoing as my invention I have hereunto subscribed my name in the presence of two witnesses.

JOSEPH NEWCOMB BLACKMAN.

Witnesses:

EDWIN B. HOUGHTON,
FRANK ROBERTS.

No. 655,195.

Patented Aug. 7, 1900.

G. K. CHENEY.
GRAMOPHONE SOUND BOX.

(Application filed Oct. 18, 1899.)

(No Model.)

Fig. 1.

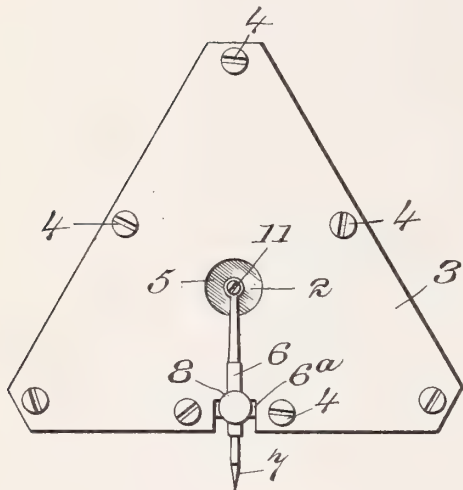


Fig. 2.

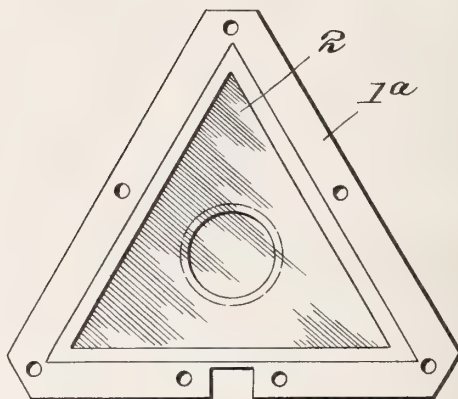


Fig. 3.

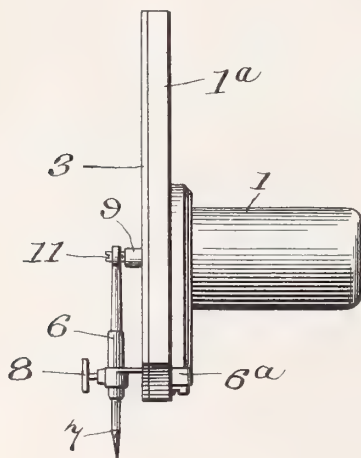
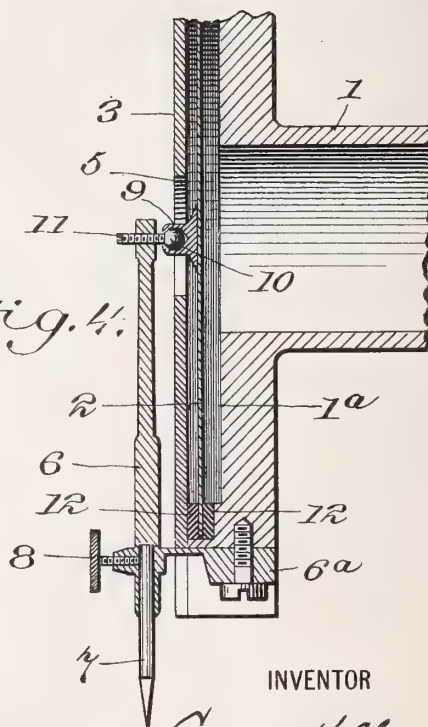


Fig. 4.



WITNESSES:

J. E. Pearson
H. H. Humphrey.

INVENTOR

George K. Cheney
BY
R. P. Perkins
ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE K. CHENEY, OF NEW YORK, N. Y., ASSIGNOR TO THE NATIONAL
GRAMOPHONE CORPORATION, OF SAME PLACE.

GRAMOPHONE SOUND-BOX.

SPECIFICATION forming part of Letters Patent No. 655,195, dated August 7, 1900.

Application filed October 18, 1899. Serial No. 733,951. (No model.)

To all whom it may concern:

Be it known that I, GEORGE K. CHENEY, a citizen of the United States of America, and a resident of New York, county of New York, and State of New York, have invented certain new and useful Improvements in Sound-Reproducing Apparatus, of which the following is a specification.

My invention relates in general to talking-machines; and it more specifically consists of an improved sound-box for talking-machines in which a triangular diaphragm is employed and in which the vibrating stylus is connected to the diaphragm by a universal joint.

The preferred form of apparatus embodying my invention is illustrated in the accompanying sheet of drawings, in which—

Figure 1 is a front elevation of a sound-box embodying my invention. Fig. 2 is a similar view with the retaining-plate and stylus removed. Fig. 3 is a side elevation of the sound-box, and Fig. 4 is a central section of the same.

Throughout the drawings like reference-figures refer to like parts.

The main portion of the sound-box has the hub 1 and the recessed portion 1^a. This recessed portion is triangular in shape, so as to receive a triangular diaphragm 2. Preferably this diaphragm and the recess for the same are made in the shape of an equilateral triangle, as shown. The retaining-plate 3 is held in place to protect and retain the diaphragm by a series of screws 4 4, or by equivalent method of fastening. This retaining-plate has an opening 5 of any convenient size and shape in its center, through which extends the connection from the diaphragm to the stylus. This stylus may be of any convenient form, but preferably consists of an arm or carrier 6, mounted on a yielding or spring arm 6^a and carrying the stylus-needle 7, which is held in position by the set-screw 8. On the center of the diaphragm is mounted a socket-piece 9, which has the surrounding walls of the socket crimped in to retain the ball 10 of a ball-and-socket joint. The pin 11, connected to the ball 10, is screw-threaded and screws into an internally-threaded perforation in the end of the stylus. The diaphragm 2 may be held

in position by any convenient arrangement of gaskets 12 12, as shown in Fig. 4.

The mode of operating my invention is as follows: The parts being assembled, as shown in Figs. 1, 3, and 4, the connection between stylus and diaphragm is properly adjusted by turning the ball 9 and threaded pin 11. When the stylus is vibrated by the needle 7 running along the groove of a sound-record, the vibrations are faithfully transmitted to the diaphragm 2 and reproduced as sound-waves of air in the sound-box.

The advantages of the invention comprise the louder, clearer, and more faithful reproduction of the sound-waves by a diaphragm of the triangular shape shown, the convenience of adjustment of the stylus and diaphragm connection by simple turning of the screw 11, and the fact that the ball-and-socket joint adjusts itself immediately to all positions of the parts and permits the same to play freely in action, while preserving a rigid connection along the line of transmission of motion. As a result the diaphragm responds easily and faithfully to every vibration of the stylus given to it by the sound-record and cannot become cramped or jammed by any variations in adjustment.

As to the triangular form of diaphragm I have found by experiment that the area of greatest vibration of a diaphragm tends in a majority of cases to assume the form of an equilateral triangle whose central point is the point of attachment of the vibrating stylus. I have observed this by exposing a diaphragm to rays of light whose reflection during vibration of the diaphragm would show accurately the area to which the vibrations were confined. I found that whatever the shape of the diaphragm the area of vibration was triangular in shape. It occurred to me, therefore, that a diaphragm triangular in shape would be more evenly and effectively vibrated for a given weight of material and area of surface than one of the usual circular form. Experiments have proved the correctness of this theory and resulted in the invention of the above-described apparatus.

Of course various changes could be made

in the details of construction shown without departing from the spirit and scope of my invention. Other means of supporting the diaphragm might be employed. Other forms of universal joint connection and other means of adjustment, &c., might be substituted for those illustrated; but all such modifications I consider to be merely unimportant variations of form and still within the scope of my invention.

Having therefore described my invention, what I claim as new, and desire to protect by Letters Patent, is—

1. The combination of a diaphragm, a stylus, and a ball-and-socket connection between the two.

2. In a talking-machine the combination of

a triangular diaphragm, a stylus, and an adjustable ball-and-socket connection between the stylus and the center of the diaphragm. 20

3. The combination of a diaphragm, a stylus, and an adjustable ball-and-socket connection between the two.

4. The combination of a diaphragm, a stylus, and a ball-and-socket connection which has its female member connected to the center of the diaphragm and its male member adjustably connected to the stylus. 25

Signed by me at New York, N. Y., this 31st day of August, 1899.

GEORGE K. CHENEY.

Witnesses:

A. PARKER-SMITH,
M. TURNER.

No. 655,225.

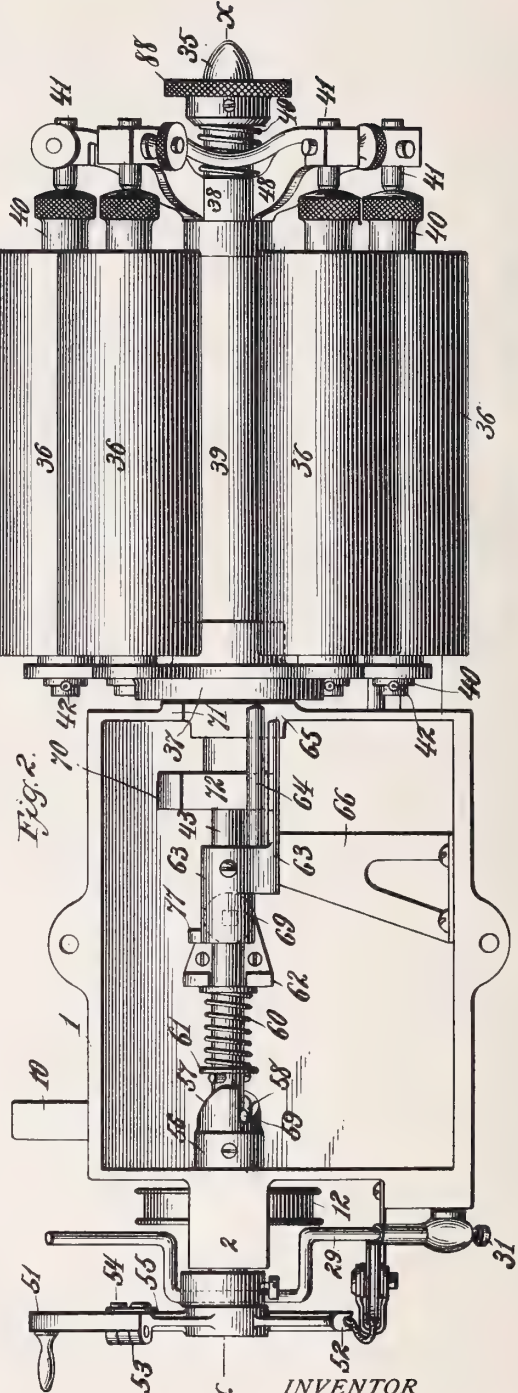
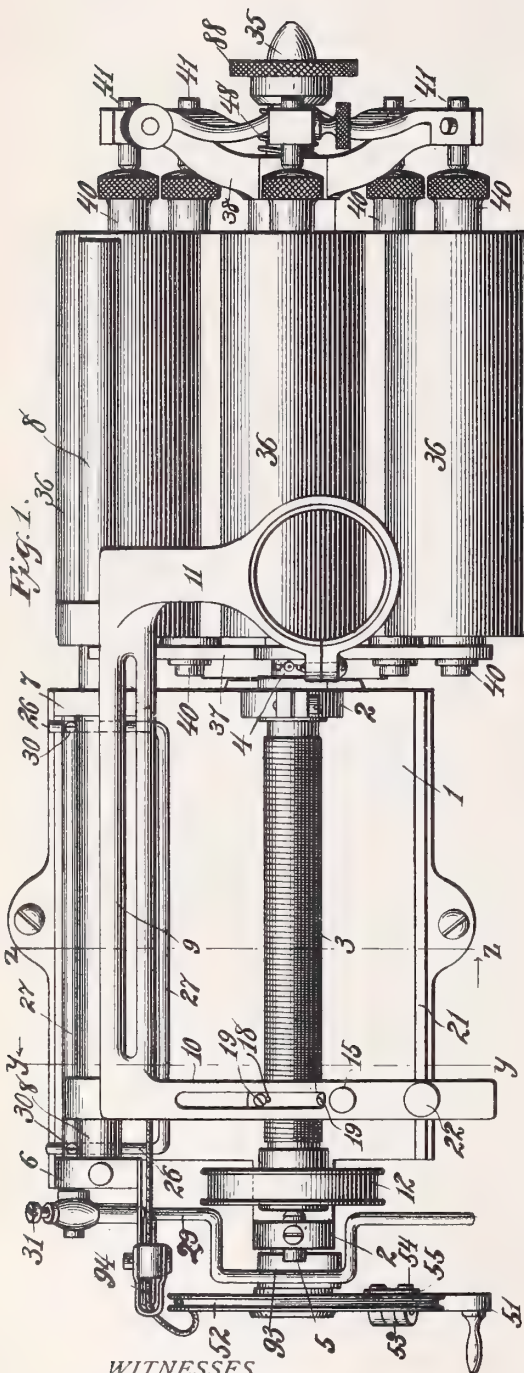
Patented Aug. 7, 1900.

G. V. GRESS.
MAGAZINE PHONOGRAPH.

(Application filed Apr. 12, 1898.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES
E. W. Furdeman
J. L. Cleas.

INVENTOR
George V. Gress
By *J. Stockman* Attorney

No. 655,225.

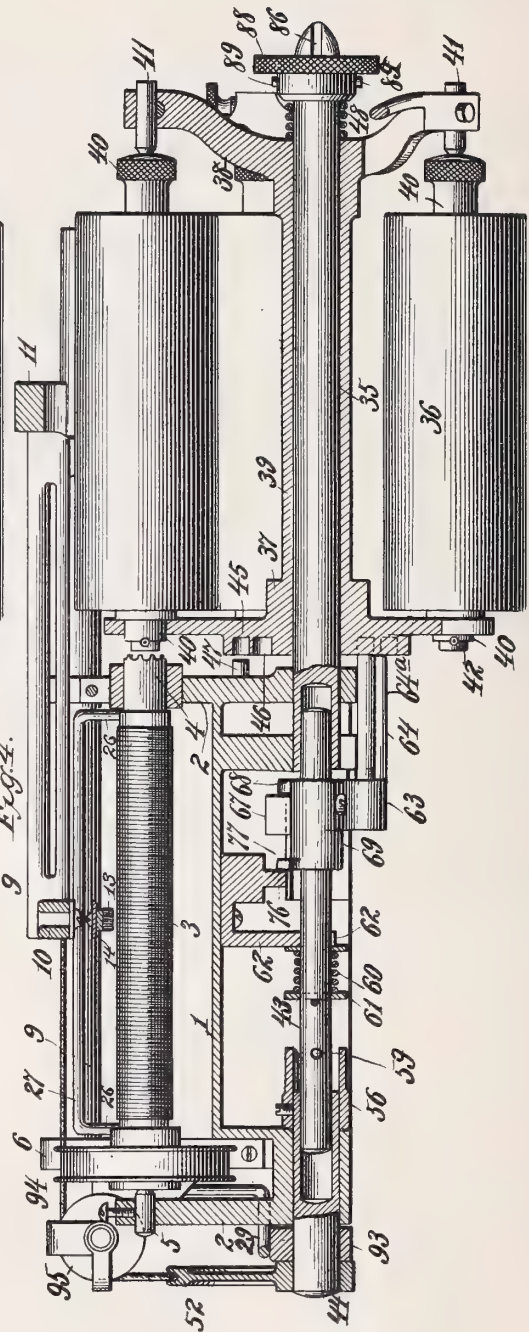
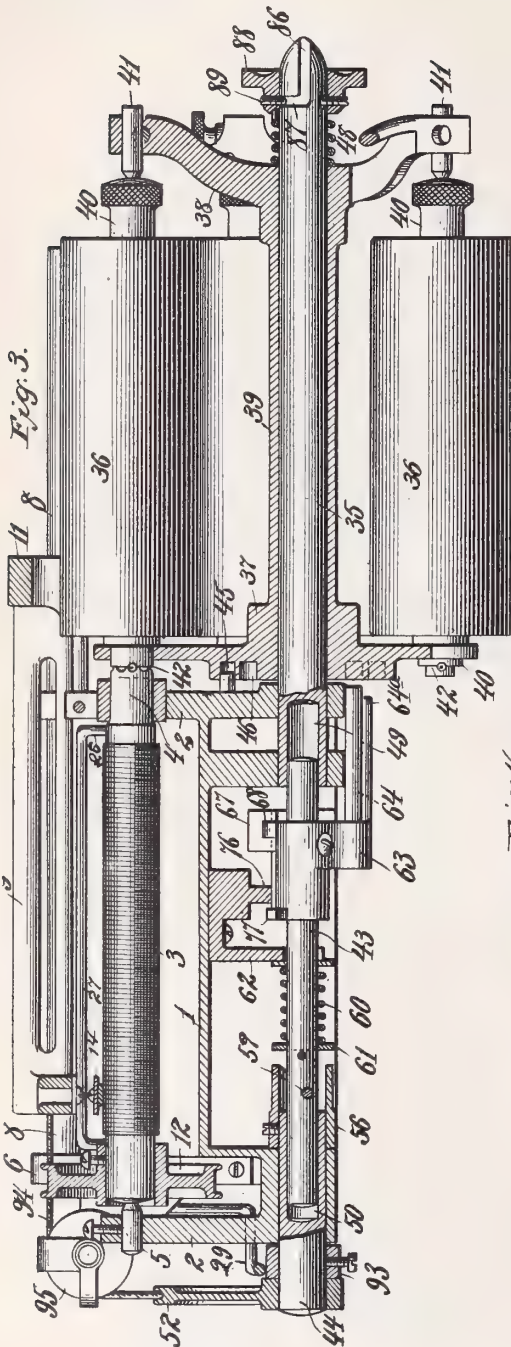
Patented Aug. 7, 1900.

G. V. GRESS.
MAGAZINE PHONOGRAPH.

(Application filed Apr. 12, 1898.)

(No Model.)

5 Sheets—Sheet 2.



WITNESSES

E. W. Woodman
J. L. Clear

INVENTOR

George V. Gress
By *J. Stockman* Attorney

No. 655,225.

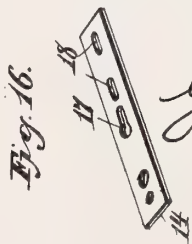
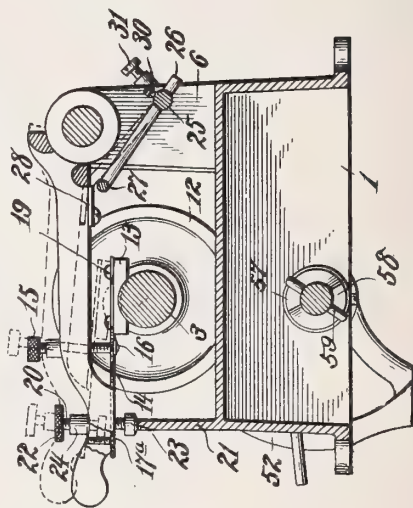
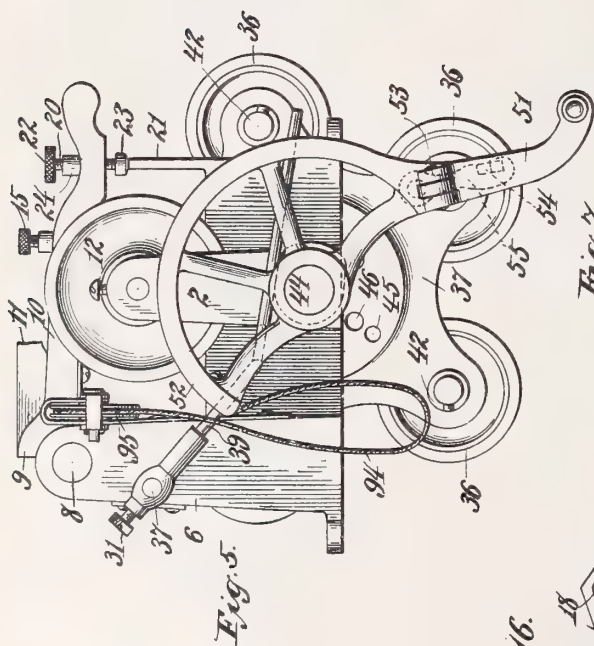
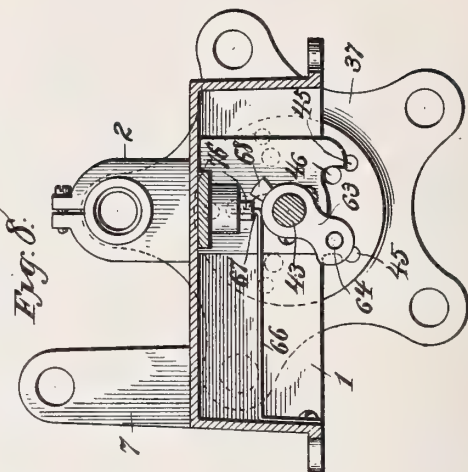
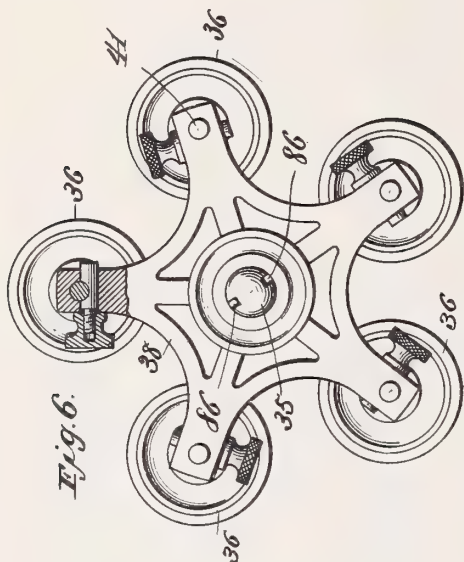
Patented Aug. 7, 1900.

G. V. GRESS.
MAGAZINE PHONOGRAPH.

(Application filed Apr. 12, 1898.)

(No Model.)

5 Sheets—Sheet 3.



WITNESSES
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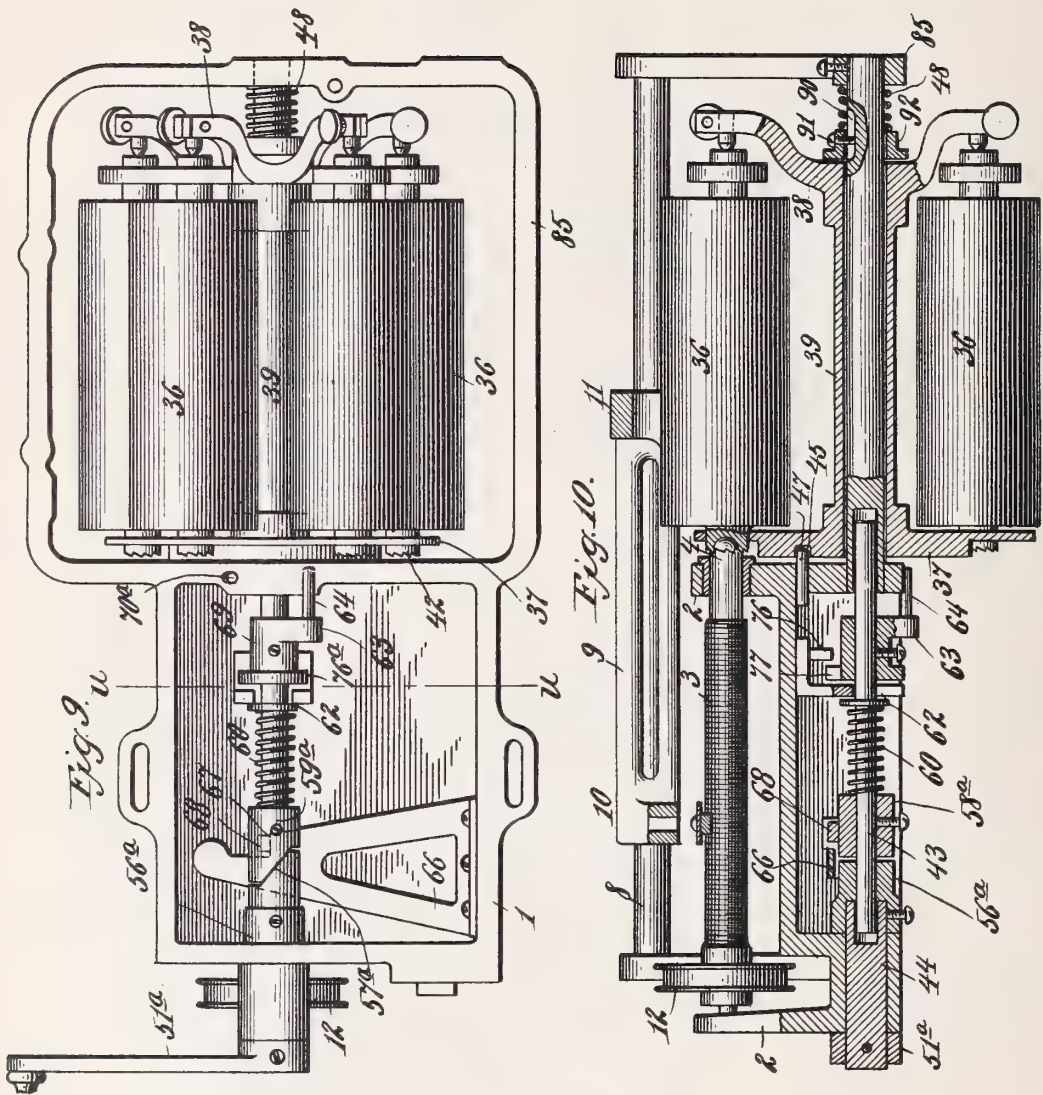
Patented Aug. 7, 1900.

G. V. GRESS.
MAGAZINE PHONOGRAPH.

(Application filed Apr. 12, 1898.)

(No Model.)

5 Sheets—Sheet 4.



WITNESSES

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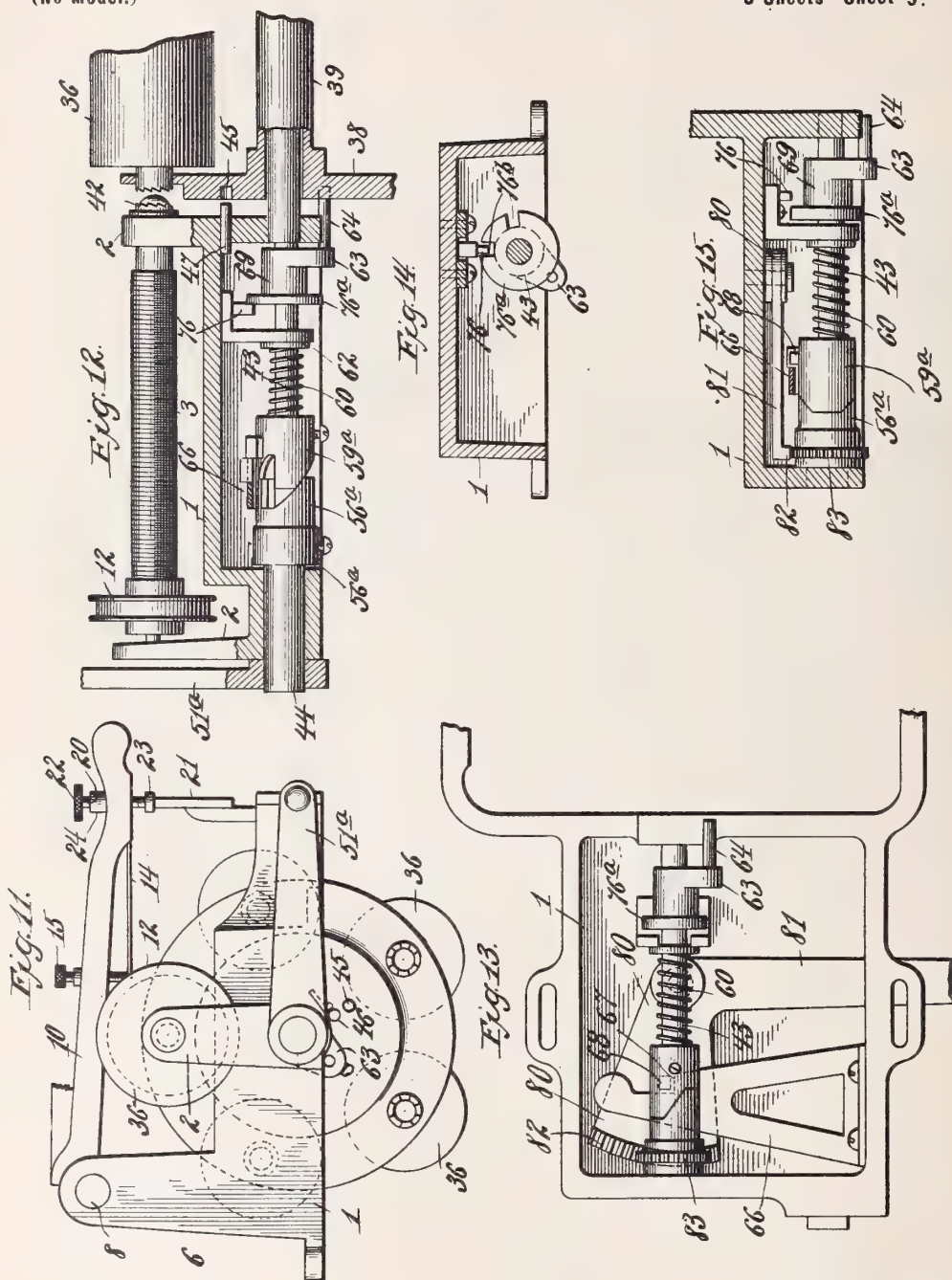
Patented Aug. 7, 1900.

G. V. GRESS.
MAGAZINE PHONOGRAPH.

(Application filed Apr. 12, 1898.)

(No Model.)

5 Sheets—Sheet 5.



WITNESSES

E. Wurdman
J. L. Cleas

INVENTOR

Georgi V. Gress
By J. Stockman Attorney

UNITED STATES PATENT OFFICE.

GEORGE V. GRESS, OF ATLANTA, GEORGIA.

MAGAZINE-PHONOGRAPH.

SPECIFICATION forming part of Letters Patent No. 655,225, dated August 7, 1900.

Application filed April 12, 1898. Serial No. 677,391. (No model.)

To all whom it may concern:

Be it known that I, GEORGE VALENTINE GRESS, a citizen of the United States, residing at Atlanta, in the county of Fulton and State of Georgia, have invented certain new and useful Improvements in Multiplex-Cylinder Phonographs; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

This invention has particular reference to that class of phonographs called "multiplex-cylinder," wherein are employed a series of cylinders successively brought into operative relation with the feed-shaft and recording or reproducing point; but many features of the invention are applicable to phonographs having a single cylinder; and the invention consists in certain peculiarities in the construction and arrangement of the parts and in certain novel combinations of the parts, substantially as hereinafter described, and particularly pointed out in the subjoined claims.

The objects of the invention are as follows: first, to provide the half-nut that engages the feed-shaft for transmitting longitudinal motion from said shaft to the diaphragm-support with means whereby said half-nut may have a maximum range of adjustment relatively to said shaft; second, to provide means whereby the diaphragm-support will be properly guided in its movement over the wax cylinder and will be adjustable relatively to said cylinder to compensate for the reduction in the thickness thereof when shaved; third, to provide improved means for holding the half-nut and diaphragm-support elevated out of operative relation with the feed-shaft and wax cylinder, respectively, and particularly to provide a construction whereby said holding means will operate automatically to raise and hold the half-nut and diaphragm-support elevated in the return of said parts to the starting-place; fourth, to provide simplified means whereby said return of the half-nut and diaphragm-support is accomplished automatically during the operation of bringing a different wax cylinder into operative

position; fifth, to provide improved means for shifting the cylinders in multiplex-cylinder phonographs to bring a different cylinder into operative relation with the recording or reproducing point, and, sixth, to provide means whereby the battery of cylinders and their supporting parts may be quickly removed from the machine in entirety and another complete battery substituted. These several objects are accomplished by the constructions shown in the accompanying drawings, wherein—

Figure 1 is a top plan view of a construction embodying all of my improvements and showing the preferred means for carrying out the several objects. Fig. 2 is a bottom plan view of the same with the parts in their normal positions. Fig. 3 is a longitudinal section on the line *xx* of Fig. 2. Fig. 4 is a central longitudinal section showing the positions of the parts at one stage of the operation of bringing a different cylinder into operative position. Fig. 5 is a view of one end of the machine. Fig. 6 is a view of the other end of the machine, partly in section. Fig. 7 is a transverse section on the line *yy* of Fig. 1 with parts broken away and showing in full and dotted lines, respectively, the adjustment of the diaphragm-support and the means for holding said diaphragm-support and the half-nut out of operative position. Fig. 8 is a transverse section on the line *zz* of Fig. 1. Fig. 9 is a bottom plan view of another form of the device. Fig. 10 is a central longitudinal section of the form shown in Fig. 9. Fig. 11 is a view of one end of the same machine. Fig. 12 is a central longitudinal section of the same with the parts in the positions they occupy in shifting the cylinders. Fig. 13 is a view of a part of a modified form of machine. Fig. 14 is a section on the line *uu* of Fig. 9. Fig. 15 is a detail of part of the form shown in Fig. 13, and Fig. 16 is a detail view of the spring for supporting the half-nut.

The same reference characters designate the same parts in the several views.

1 designates the base of the machine, having uprights 2 at its ends, forming bearing for the threaded feed-shaft 3, one end of which latter is constructed to form a clutch member 4 for engaging the contiguous end of

the mandrel-shaft, hereinafter described, and has its other end journaled upon a removable center pin 5 to permit it to be removed when desired. Said base 1 is also provided with standards 6 and 7, which support a bar 8, that forms a guide for a sleeve 9 to travel upon, said sleeve having forwardly-projecting arms 10 and 11 at its ends, the former of which carries means, hereinafter described, for engaging said feed-shaft to communicate longitudinal motion to the sleeve, and the latter of which arms carries the usual diaphragm. The feed-shaft 3 is provided with a pulley 12, actuated by a belt from a suitable motor to rotate said shaft.

The means engaging the feed-shaft 3 to cause the recording or reproducing point to be fed over the rotating wax cylinder or phonogram consists of a nut-section 13, carried by a spring-arm 14, secured at its forward end to the arm 10, and for the purpose of adjusting said spring to regulate the engagement of said nut-section with the feed-shaft I employ an adjusting-screw 15, which is threaded in said arm 10 and extends through the arm 14, beneath which latter it has a head 16. The arm 14 has an opening 17, one end of which is wider than said head 16 to permit the latter to pass through and the other end of which is narrower than said head to prevent disengagement of said head and spring-arm when the parts are assembled, and said spring-arm is removably secured to the arm 10 by a screw 17^a. Said spring-arm is, furthermore, formed with elongated slots 18, through which pass the screws 19, that secure the nut-section 13 thereto. Thus the half-nut 13 is adjustable longitudinally upon the spring-arm, and the end of the spring-arm is adjustable toward and from the feed-shaft 3, whereby proper engagement of said half-nut with the feed-shaft is at all times insurable.

In lieu of the usual means for causing the diaphragm-support and nut-carrying arm to move in a truly-straight line over the wax cylinder and feed-shaft, respectively, I employ an adjustable screw 20, which extends through the arm 10 and rests upon the upper straight edge of a guide-flange 21, projecting from the forward end of the base 1, whereby said screw not only guides the parts stated, but when turned will adjust the diaphragm-support relatively to the cylinder to conform to the thickness of the latter, thus enabling wax cylinders to be used until by repeated shaving thereof they have been entirely destroyed. Preferably the adjusting-screw 20 has heads 22 and 23 at each end, the former for convenience in adjusting it and the latter to rest upon the guide 21 without marring the same, and is provided with a loose collar 24 to limit the adjustment.

A novel means has been devised by me for raising the arms 10 and 11, with the parts carried thereby, to stop the recording or reproducing without stopping the machine. For

this purpose a shaft 25 is journaled in the standards 6 and 7 and has between the latter two forwardly and upwardly extending arms 26, connected by a rod 27. Normally the position is such that the rod 27 is slightly below the plane of the under side of arm 10; but when said rod is raised it engages said arm and raises the same, together with arm 11, thus disengaging the half-nut from the feed-shaft and the recording or reproducing point from the wax cylinder. The under side of said arm 10 is formed or provided with a shoulder 28, so located thereon that when the parts have been raised the required extent it will be engaged by said rod 27, whereby said parts will be held in elevated position automatically until by further raising said arm 10 by hand its shoulder is disengaged from said rod to allow the latter to drop by gravity to its former position, when said arms 10 and 11 may be lowered to operative position. The end of the shaft 25 is provided with an operating lever or handle 29. In order to permit adjustment the arms 26 extend loosely through the shaft 25 and are held by screws 30, and the handle 29 is secured to the end of said shaft by the adjustable screws 31. This latter feature is especially important when, as hereinafter described, the handle is operated automatically by an eccentric.

As thus far described the improved constructions of parts are applicable to single-cylinder phonographs; but my invention has more particular relation to that type of phonographs (called "multiplex-cylinder phonographs") wherein are employed a plurality of cylinders which are brought one at a time under the action of the recording or reproducing points. In the accompanying drawings I have shown the latter type of machine, and while I have shown five cylinders in each case I wish it understood that the features related to said type of machine are not limited to employment with said number of cylinders, but that my invention contemplates the use of any number of cylinders more than one.

35 designates an axial rod or bar, which projects from the end of the base 1 and supports the frame carrying the mandrels 36, upon which latter are mounted the usual wax cylinders or phonograms. For convenience this frame is hereinafter called a "reel," and it comprises two suitably-constructed heads 37 and 38, connected by a sleeve 39, rotatably and slidably mounted on said rod 35. The mandrels must be capable of independent rotation between said heads, and are capable of independent removal therefrom to enable a change of wax cylinder upon any one of the same. For these purposes the shaft 40 of each is journaled at one end in said head 37, and its other end is journaled upon a removable or movable center pin 41, supported by the head 38. The inner ends of said shafts 40 project beyond said head 37 and are suitably constructed to interlock with the clutch member 4 at the end of the feed-shaft 3, as shown

at 42, to cause the feed-shaft and the adjacent mandrel to rotate in unison.

As thus far described the invention is similar in substance to others previously proposed, and, like other machines of this type, in bringing a different cylinder into operative relation with the feed-shaft the frame carrying the cylinders is moved longitudinally upon its axis to disengage a mandrel-shaft 40 from the feed-shaft and then turned the exact distance between two consecutive cylinders and returned longitudinally to engage the mandrel-shaft that is now opposite the feed-shaft 3 with the latter; but the mechanism heretofore used for securing this result has been comparatively complicated, expensive, liable to get out of order, and unreliable in action, because the construction has contained many delicate parts and the return of the reel has produced a jar or shock which has caused the parts to be forced endwise, and thus broken or moved out of place. These disadvantages are overcome by my improved construction of operating means, which consists, generically, of two separate shafts 43 and 44, mounted in the base 1 of the machine, one of which shafts, 43, is capable of both longitudinal and rotary motion in its bearings, suitable mechanism for locking said shaft 43 against rotation until it has moved longitudinally a predetermined distance, a suitable device movable with said shaft 43 for engaging the reel and imparting the motion of said shaft thereto, and suitable devices controlled by the action of said shaft 44 and so constructed as to coöperate with the locking mechanism above referred to in imparting successive longitudinal and rotary motion to said shaft 43. This generic idea may be embodied in different forms of mechanism, several of which are shown and described in the present case without departing from the spirit of my invention.

The detail constructions preferred by me are as follows: The reel-head 37 is provided with two series of holes 45 and 46, spaced to correspond with the location of the cylinder-carrying mandrels. The outer series 45 are adapted to receive a stationary pin 47, projecting from the base 1, whereby the reel is held in position for engagement of a mandrel-shaft 40 with the feed-shaft 3. At the outer end of the rod 35 is a spring 48, which will yield to pressure to permit the reel to move to the right and will return the same when said pressure is released. The inner end of said rod 35 has an opening 49, which receives the adjacent end of the shaft 43, and the other end of said shaft is supported in an opening 50 in the end of the shaft 44, whereby the longitudinal movement above specified is permitted.

In the preferred construction of the device there is shown a peripherally-grooved segment 52, to which is hinged a crank-arm 51, which crank-arm is capable of being folded against the segment for convenience when

the device is not in use and is secured in extended position by means of a hook 55 and lug 54. The shaft 44 is rotated by turning said crank-arm and segment, and the segment has a further function, hereinafter fully set forth; but, if desired, the shaft 44 may be provided with an operating-handle 51^a of ordinary form, as shown in Fig. 9, without departing from the spirit of the invention.

The contiguous ends of the shafts 43 and 44 are provided with clutch devices relatively so constructed as to coact with the locking devices above referred to, and which are hereinafter specifically described, in translating rotary motion of the shaft 44 into successive longitudinal and rotary motion of the shaft 43. This clutch device, as shown best in Figs. 2 and 7, may consist of a collar 56, mounted on the inner end of the handle-shaft 44 and having recesses in its end formed with walls sloped to form two end cam-surfaces 57 and 58, which cam-surfaces are engaged by a pin 59, projecting laterally from both sides of the adjacent end of the shaft 43, or, as shown in Figs. 9 and 13, said clutch may consist of two locking-jaws 56^a and 59^a, one on each shaft, which have the adjacent sides of their walls sloped, as shown at 57^a, to form engaging end-faced cams. In either construction the clutch-cams will operate when the handle-shaft 44 is turned and the shaft 43 is locked against oscillation to move said shaft 43 longitudinally to the right. The shaft 43 is pressed yieldingly to the left by means of a spring 60, having at one end an abutment 61, fixed to said shaft, and at its other end an abutment 62, projecting from the base 1 of the machine, whereby said clutch devices on the contiguous ends of the shafts 43 and 44 are held in engagement with each other at all times. Said shaft 43 is also provided with an arm 63, having a pin 64, which pin when in its normal position just clears the head 37 of the reel carrying the battery of cylinder-supporting mandrels and is in registry with the adjacent hole 46 in said head and also engages the surface 65 of the base 1, whereby oscillation too far in one direction is prevented. Said arm 63 is preferably provided with a pin 64^a, which is parallel with said pin 64 and engages the surface of said head 37 when the pin 64 has been inserted as far as necessary in the hole 46. The means for locking said shaft 43 against rotation or oscillation during a portion of the rotation or oscillation of said shaft 44, so as to compel said shaft 43 first to move endwise, will now be described.

Secured at one end to the base 1 is a spring-arm 66, having a ledge 67 at its free end, which ledge is adapted to engage a lug 68, which moves with the shaft 43. This lug in the one construction, as shown best in Figs. 3 and 4, projects from a sleeve 69, which is fixed to said shaft 43 and carries the pins 64 and 64^a; but in the form of the device employing two end-faced cams said lug prefer-

ably projects from the cam or clutch member 59^a. In the normal position of the parts this lug engages the ledge 67 and prevents rotation of the parts while the shaft 44 is being turned in one direction a certain predetermined distance, but allows said shaft 43 to move endwise. This ledge is of such length that when said shaft 43 is moved to the right the distance which results in disengaging the hole 45 in the head 37 from the pin 47 the lug 68 will have passed beyond the ledge, so that further rotation of the shaft 44 will cause the shaft 43 to rotate or oscillate and carry with it the reel-frame and cylinders the distance between two consecutive mandrels. Suitable stops to be engaged by the pin 64 when thrown upward for limiting the oscillation of said shaft 43 and reel are provided, which stops may consist of alined projections 70 and 71, respectively formed integral with the base 1 and with a hanger 72, supporting the shaft 43, as shown in Fig. 2, or, if preferred, of a screw 70^a, as shown best in Fig. 9. The stop or stops are so placed as to be engaged by said pin 64 when the reel has been rotated an exact subdivision of the circle corresponding to the location of the mandrels therein. One of the holes 45 in the head 37 is at this time in registry with the locking-pin 47. To engage the mandrel-shaft 40, now opposite the feed-shaft 3, with said feed-shaft and the hole 45 with the locking-pin 47, the shaft 44 is turned, by means of the crank 51 or 51^a, in the opposite direction to that imparted to it in accomplishing the disengagement and rotation above specified, and during the first part of this movement the shaft 43 is locked against rotation, but allowed to move endwise to the left, by means of a stationary pin 76, projecting from the base 1 into position to be engaged by a shoulder 77, projecting from the sleeve 69, as shown in Fig. 4, or, as shown in Figs. 9, 10, and 14, the same result may be accomplished by means of a collar 76^a on the sleeve, having two radial notches 76^b to engage said pin 76, said notches being spaced to correspond with the spacing of the mandrels. The pin 76 and the shoulder 77 are so arranged that when the parts are in their normal positions (shown in Fig. 3) the pin 76 is to the right and in the rear of the shoulder or lug 77; but after the shaft 43 has moved endwise its full extent the shoulder will have moved to the right of the pin 76, as shown in Fig. 4, just sufficient to permit it to pass by the said pin when shaft 43 is turned. The lug and pin will also be so arranged that when the shaft 43 has completed its turning movement the front face of the lug 77 will be very slightly in rear of the rear face of the pin, just sufficient to permit the lug to move behind the pin immediately the spring 60 begins to move the shaft 43, which it will do as soon as the operator begins to reverse the movement of the crank. Continued reverse movement of the crank will result in endwise movement of the shaft 43

until the lug 77 has passed out of engagement with the pin 76, when said shaft will be free to turn and resume its normal position. The same action occurs with the construction embodying the notched collar 76^a, one of the notches being for the purpose of affording a passage-way for the pin 76 when the shaft 43 is moved endwise to the right and the other notch to temporarily engage the pin 76 when the shaft 43 moves to the left in a manner similar to that of the lug 77. The endwise movement of the shaft 43 during the engagement of the pin 76 and lug 77 will be sufficient to permit the mandrel-shaft 40 to engage the feed-shaft 3 and to withdraw the pin 64 from the hole 46 in the head 37 of the reel. The shaft 43 will then be free to turn and restore the pin 64 to its normal position.

It will readily be seen that as the turning of the clutch member 44 is controlled by the operator an easy and gradual return of the reel and the parts carried thereby is assured and the shock and consequent disarrangement of the parts inseparably connected with previous proposals prevented.

In the return endwise movement of the shaft 43 the lug 68 will be moved opposite the spring-arm 66, and when the shaft is being rotated to return the pin 64 to its normal position said lug will engage the spring-arm and force it back until the lug clears it, when it will return to its normal position, bringing the ledge 67 beneath the lug.

In the modified construction shown in Figs. 13 and 15 is a different connection for operating the device. In this form the handle-shaft 44 does not project beyond the end of the case or frame, and said shaft instead of being operated by a crank is operated by a pivoted lever having two arms 80 and 81, the latter extending into position to be operated by hand. The arm 80 is provided at one end with a toothed segment 82, which intermeshes with a pinion 83 upon the clutch member carried by the shaft 44. As the lever 81 is moved sidewise the segment will rotate the pinion 83 and shaft 44. The operation of the device is otherwise identical with those above described.

As shown best in Figs. 1, 2, 3, and 4, means may be provided by which the reel and battery of cylinders may be removed at once from the machine. When this means is employed, the frame 85, shown in the other form as supporting the outer end of the axial bar, is dispensed with, and said outer end of the axial bar is formed with longitudinal recesses or channels 85 at its opposite sides, terminating at the inner end in the channels 87, extending at right angles therewith. The cap 88, to which the spring 48 is preferably secured, holds the reel upon said axial bar and is provided with inwardly-projecting pins 89, which normally project into the channels 87, and thus lock the cap to the bar. When it is desired to remove the reel and cylinders, the

cap is turned until the pins 89 register with the slots 86 and may then be withdrawn, together with the spring 48, to permit the free removal of the reel and cylinders. The outer end of the bar may, as shown in Fig. 10, be formed with a channel 90, into which projects a pin 91, extending from a collar 92, which collar in this form of the device forms the inner abutment for the spring 48, whereby the reel is guided in its reciprocations upon the bar.

In the illustration of one form of the device I have also shown means whereby the rotation of the shaft 44 operates, in addition to the shifting of the cylinders, to raise the diaphragm-support above the wax cylinder and the half-nut above the plane of the feed-shaft and to return said parts to the starting-place. To accomplish the first of these purposes, a cam 93 is fixed on the outer end of said shaft 44 and supports the arm 29 of the elevating means above described. Normally this arm rests upon the shorter side of the cam or eccentric, so that when the shaft 44 is rotated the longer side of said cam is brought into engagement with the arm 29 and lifts the same, thus raising the rod 27 and elevating the arms 10 and 11, which are engaged with said rod 27. The automatic return of the diaphragm-support and half-nut to the starting-place is accomplished by means of a cord 94 or other suitable device, which is secured at one end to the arm 10 and at its other end to the segment 52, above described, and extends over a pulley 95. Thus when the operating-crank is turned to rotate the shaft 44 the segment will be turned and will draw on said cord, thus moving the sleeve 9 and connected parts to the left; during which return movement said parts are supported by the elevated rod 27. The peripheral groove in the segment 52 receives the cord while the latter is being drawn to the left and insures the proper operation of these parts.

I do not wish to be understood as limiting myself to the details of construction above set forth, as many forms of mechanism other than those above described may be employed for carrying out my invention without departing from the spirit thereof.

Having thus described the invention, what I claim is—

1. In a multiplex-cylinder phonograph, the combination with the longitudinally-movable and rotatable reel carrying the cylinders, of a cylinder-shifting means comprising two shafts, devices for locking one of said shafts against rotation until it has moved endwise a predetermined distance, devices carried by the latter shaft for engaging the reel, and means connecting the contiguous ends of said shafts and coacting with said locking devices in translating rotary motion of the one shaft into successive longitudinal and rotary motion of the other shaft, substantially as shown and described.

2. A cylinder-shifting means for multiplex-

cylinder phonographs containing a first and a second shaft mounted end to end, a clutch having one member mounted on the first shaft and its other member mounted on the second shaft, said clutch having cam-surfaces, and a device coacting with said clutch in translating turning movement of the one shaft into successive endwise and turning movement of the other shaft.

3. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a handle-shaft, a second shaft, a clutch one member of which is mounted upon the handle-shaft and the other member upon said second shaft, said clutch having cam-surfaces, a spring pressing said members toward each other, and a non-rotating lock for the second shaft, freed by an endwise movement thereof.

4. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel having locking-holes in one head, a locking device engaged with and freed from the reel by endwise movement of the reel, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by an endwise movement of said second shaft, a clutch connecting said handle-shaft and second shaft and having cam-surfaces, and a non-rotating lock for the second shaft freed by an endwise movement of said shaft.

5. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel having locking-holes in one head, a locking device engaged with and freed from the reel by an endwise movement of said reel, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by an endwise movement of the second shaft, a clutch connecting said handle-shaft and second shaft and having cam-surfaces, a non-rotating lock for the second shaft freed by the endwise movement of the latter, and stops limiting the oscillations of the second shaft.

6. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel having holes in one head, a locking device engaged with and freed from the reel by endwise movement of said reel, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by endwise movement of said second shaft, a clutch connecting said shafts and having cam-surfaces, a lug movable with the second shaft, and a spring-arm engaging said lug and preventing rotation until cleared by the endwise movement of the second shaft.

7. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel having holes in one head, a locking device engaged with and freed from the reel by endwise movement of the reel, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by endwise movement of the second shaft, a clutch connecting said shafts and having cam-surfaces, a lug movable with said second shaft, a spring-arm engaging the same and preventing rota-

tion until cleared by the endwise movement of the second shaft, and stops limiting the oscillations of the second shaft.

8. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel, having locking-holes in one head, a locking device engaged with and freed from the reel by endwise movement of said reel, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by endwise movement of said second shaft, a clutch connecting the contiguous ends of said shafts, said clutch having cam-surfaces, a spring for returning said second shaft, and a non-rotating lock for said second shaft freed by endwise movement thereof.

9. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel having locking-holes in one head, a locking device engaged with and freed from the reel by endwise movement of the latter, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by its endwise movement, a clutch connecting the contiguous ends of said shafts and having cam-surfaces, a spring for returning the second shaft, a non-rotating lock for the second shaft, freed by the endwise movement thereof, and stops limiting the oscillation of the second shaft.

10. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel having locking-holes in one head, a locking device engaged with and freed from the reel by endwise movement of the latter, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by endwise movement of the second shaft, a clutch connecting the contiguous ends of said shafts and having cam-surfaces, a lug movable with the second shaft, a spring engaging said lug and preventing rotation of the second shaft until cleared by the endwise movement thereof, and a spring for returning said second shaft.

11. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a cylinder-carrying reel having locking-holes in one head, a locking device engaged with and freed from the reel by endwise movement of the reel, a handle-shaft, a second shaft adapted to connect the handle-shaft and reel by endwise movement of the second shaft, a clutch connecting the contiguous ends of said shafts and having cam-surfaces, a pin fixed in the machine-base, and a device movable with the second shaft and engaged by said pin to prevent oscillation of the second shaft.

12. A cylinder-shifting mechanism for multiplex-cylinder phonographs, comprising a handle-shaft, a second shaft-interlocking jaw-clutches formed to provide end-faced cams, one part mounted on the handle-shaft and the other part upon the second shaft, said second shaft having a longitudinal reciprocating and oscillating movement, and locking devices for the second shaft preventing its oscillation except at the ends of its longitudinal reciprocations.

13. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a longitudinally-movable and rotative reel carrying the cylinders, a shaft mounted to move endwise and to turn, means for imparting successive endwise and oscillatory movement to said shaft, and a device connecting said shaft with the reel for transmitting the motion of the former to the latter.

14. A cylinder-shifting means for multiplex-cylinder phonographs, comprising a longitudinally-movable and rotative reel carrying the cylinders, a shaft mounted to move endwise and to turn, means for imparting successive endwise and oscillatory motion to said shaft, and a device connected with and disconnected from said reel by the reciprocatory movement of said shaft and serving when engaged with the reel to turn the same in one direction.

15. A cylinder-shifting means for multiplex-cylinder phonographs comprising a cylinder-carrying reel having holes in one head, a shaft mounted to move endwise and to turn, means for imparting successive endwise and oscillatory motion to said shaft, an arm attached to said shaft, a pin projecting from said arm and designed to be inserted in said holes and withdrawn therefrom by the endwise motion of said shaft.

16. In a multiplex-cylinder phonograph, the combination with the base, and the cylinder-carrying reel having two series of holes in one head, of a pin projecting from the base and designed to engage the holes of one series, a shaft, means for causing said shaft both to reciprocate and to oscillate at each end of its reciprocations, and a pin carried by said shaft and inserted into and withdrawn from the holes of the second series by the reciprocations of said shaft.

17. In a multiplex-cylinder phonograph, the combination with the cylinder-carrying reel, of a shaft, a lug movable therewith, a spring-arm having a ledge to engage said lug, a pin projecting from the machine-base, a device carried by the shaft to engage said pin, means coacting with said arm and lug and with the pin and said device for causing said shaft to reciprocate and to oscillate at the ends of its reciprocations, and means for connecting said shaft with said reel.

18. In a multiplex-cylinder phonograph, the combination with the cylinder-carrying reel having holes in one head, of a shaft, a relatively-fixed spring-arm and pin adjacent to said shaft, devices movable with the shaft to be engaged by the spring-arm and pin respectively so as to lock said shaft against oscillation but permit it to reciprocate, said locking devices being disengaged by endwise movement of said shaft, and means, coact-

ing with said locking devices for reciprocating said shaft, said means also serving to oscillate the shaft at the ends of its reciprocations, and a pin carried by said shaft and inserted into and withdrawn from said holes by the endwise movement of said shaft.

19. The combination with a guided sleeve, having a nut-carrying arm at one end and a diaphragm-arm at its other end, both of said arms projecting forward from the sleeve, the nut-section on one arm, and the feed-shaft engaged thereby, of the cylinder-shifting mechanism, having a shaft, an eccentric fixed on said shaft, a rod engaging said arms and operating when turned to simultaneously elevate both of the same, and a handle projecting from said rod and engaging said eccentric.

20. The combination with a reel, a shaft having a handle, a second shaft located between said handle-shaft and reel and having means to engage the reel, and means for translating rotary motion of the handle-shaft into successive endwise and rotary motion of the second shaft, of an eccentric on said handle-shaft, the feed-shaft, the connected arms carrying the feed-nut and diaphragm-support, respectively, a rod engaging said arms and elevating the same simultaneously, and a handle for said rod, engaging said eccentric.

21. A reel, a shaft, having a segment provided with a handle for turning said shaft, a means operated by said shaft to move the reel endwise and turn it, the feed-shaft, the connected arms carrying the nut-section and diaphragm-support, respectively, means operated by the first-mentioned shaft for elevating said connected arms simultaneously with the movement of the reel, and a connection between said segment and the arms for drawing the latter to the starting-place when elevated.

22. The feed-shaft, connected arms carrying the shaft-engaging device and diaphragm-support, respectively, a reel, a shaft having a handle, means operated by the handle-shaft for shifting the reel, an eccentric fixed on said handle-shaft, a U-shaped pivoted support for said connected arms, and a rod connected with said support and engaging said eccentric.

23. In a multiplex-cylinder phonograph, the combination with the feed-shaft, and the connected arms carrying the shaft-engaging device and diaphragm-support, respectively, of the cylinder-shifting mechanism, embodying a handle-shaft, an eccentric mounted on said shaft, a segment also mounted on said shaft, a rod engaging said connected arms, an elevating-handle for said rod, engaging said eccentric, and means connecting said segment with one of said arms.

24. The feed-shaft, connected arms carrying the shaft-engaging device and diaphragm-support, respectively, one of said arms having a shoulder, and an elevating means for said arms, consisting of a pivoted device which

when raised will engage said shoulder and hold the arms elevated, and a handle projecting from said device by which it may be elevated.

25. In a multiplex-cylinder phonograph, the combination with the cylinder-carrying reel and its shifting mechanism, said shifting mechanism having a handle-shaft by which it is operated, of the feed-shaft, the connected arms carrying the shaft-engaging device and diaphragm-support, respectively, one of said arms having a shoulder, and a pivoted elevating device for said arms, said device being arranged to engage said shoulder and hold the arms elevated an arm projecting from said device and having a free end in position to be lifted by hand, and an eccentric engaging the latter arm for lifting it automatically during the shifting of the cylinders.

26. In a phonograph, the combination with the feed-shaft, and an arm projecting forwardly over the same, of a spring-arm secured at one end to said arm, a half-nut secured to the free end of said spring-arm, and an adjusting-screw for said spring-arm, threaded through the first-mentioned arm, substantially as described.

27. In a phonograph, the combination with the feed-shaft, and an arm projecting forwardly over the same, of a spring-arm secured at one end to the first-mentioned arm by a screw, a half-nut adjustably secured to said spring-arm, and an adjusting-screw threaded through said first-mentioned arm and extending through an elongated slot in said spring-arm.

28. In a multiplex-cylinder phonograph, the combination with the base and the axial bar or rod supported at one end by said base, of the cylinder-carrying reel rotatably and slidably mounted on said bar and removable therefrom, and the removable cap on the end of said bar, substantially as described and for the purposes specified.

29. In a multiplex-cylinder phonograph, the combination with the base, of an axial bar or rod projecting therefrom, said bar having L-shaped channels or recesses in its end, a rotatable and slidable cylinder-carrying reel removably mounted on said bar, and a removable cap for the end of said bar having pins to engage the channels therein.

30. In a multiplex-cylinder phonograph, the combination with the base, and the axial bar or rod supported at one end by said base, of the cylinder-carrying reel rotatably and slidably mounted on said bar and removable therefrom, a coiled spring on the free end of said bar, engaging said reel, and a removable cap on the end of said bar engaged by the outer end of said spring.

31. In a multiplex-cylinder phonograph, the combination with the base, the axial bar supported near one end by said base and having an opening in its inner end, and the ro-

tatable and slidable cylinder-carrying reel mounted on said bar, of a shaft projecting at one end into said opening, a handle-shaft having an opening to receive the other end of
5 the first-mentioned shaft, devices for translating oscillatory motion of the handle-shaft into successive endwise and oscillatory motion of the first-mentioned shaft, and devices

connecting said first-mentioned shaft with the reel.

10

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE V. GRESS.

Witnesses:

C. J. STOCKMAN,

LUTHER V. MOULTON.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE
AMERICAN GRAPHOPHONE COMPANY, OF WEST VIRGINIA.

SPEED-REGULATOR.

SPECIFICATION forming part of Letters Patent No. 647,503, dated April 17, 1900.

Application filed November 9, 1899. Serial No. 736,382. (No model.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, a citizen of the United States, and a resident of Bridgeport, Connecticut, have invented a
5 new and useful Improvement in Speed-Regulators for Graphophones, which is fully set forth in the following specification.

My invention relates to regulating devices for motors, and more particularly to a brake
10 device for automatically regulating the governors of spring-motors for graphophones or other machines where it is essential that the speed be absolutely uniform.

The usual governor employed with spring-
15 motors for graphophones consists of a revolvable shaft driven from the motor by a suitable intermediate train and having on it a fixed disk and a second disk that turns with the shaft, but is free to slide longitudinally
20 thereon and connected to the fixed disk by flexible strips, each carrying a weight. The centrifugal force of the weights, bending the strips outward, moves the sliding disk along its shaft toward the fixed disk. This longitudinal movement of the sliding disk carries
25 it against a friction-pad with a force and consequent friction proportioned to the rapidity with which the governor is revolving. The friction-pad is carried on a lever
30 so that it can be moved against the sliding disk and held there (by suitable means) with sufficient force to stop the rotations entirely. A set-screw under the rear end of the lever provides for adjusting the position of
35 the friction-pad when the lever is released. An objection to this construction lies in the fact that the brake applies its friction at the end of the intermediate train, so that while each tooth of the pinion on the governor-shaft is turning there is a slight checking of
40 the intermediate train, followed by a corresponding acceleration as the tooth is released. This produces an intermittent audible jarring that interferes with satisfactory sound reproduction by the graphophone. My invention avoids this objection by applying the
45 greater part of the friction to a wheel or other moving part of the power-transmitting train at a point nearer to the motor, which I accomplish by having a lever with a pad at each end, one of which is shifted by the lon-

gitudinal sliding of the disk of the governor so as to force the other against the wheel or other movable member to which it is to be applied.

In the drawings annexed hereto, Figure 1
is a plan view showing my invention applied to the governor of an ordinary graphophone, and Fig. 2 is an elevation viewed from the
broken line X X in Fig. 1.

In my device A is the front portion of the middle bearing-plate of an ordinary graphophone. B is a shaft passing through this plate and connected on the other (far) side thereof
60 with the spring-motor by the usual train of gears. On shaft B is fast the large gear C and also the drum for carrying belt b, which rotates the mandrel. (Not shown.)

D is the shaft of the usual governor, driven through a pinion C' by gear C.

E is the longitudinally-slidable friction-disk that turns with shaft D.

F is a lever pivoted, as at f, and carrying at its end lever G, which is shown as pivoted at G' about one-third of the distance from its
75 end, so that the friction-pad g at the end of its longer arm shall be opposite slidably disk E, while friction-pad g' on the end of the shorter arm is opposite gear C. The outer face of lever F is inclined upward away from plate
80 A, and lever H (with handle H') is pivoted to the plate A at h, so that its outer end plays over the inclined end of lever F. A set-screw A' turns through plate A against the lower side of lever F at the end f'.
85

The mode of operation is as follows: When the lever H is turned into the position shown in Fig. 2, it forces the end of lever F down toward plate A, so that pads g g' are held
90 against disk E and gear C with sufficient force to stop all rotation. When the lever H is moved in the direction indicated by the arrow, lever F is free to be moved away from plate A, and the pads g g' are pushed aside by the revolution of disk E and gear C. As
95 the speed increases sliding disk E moves longitudinally along its shaft D away from plate A and bears against pad g. The immediate result of this is to swing pad g out and force pad g' against gear C with approximately
100 double force. When the speed has reached the maximum desired, both pads are operat-

ing as friction-brakes; but on account of the leverage the greatest friction is applied to gear C. Another result of this construction is that the slightest longitudinal movement of disk E is translated with double force into friction against gear C.

Of course this invention is not limited to use with spring-motors or for graphophones, nor do I limit myself to the exact construction shown. For instance, friction-pad *g'* may be applied to any other moving part of the intermediate train and the proportions and exact arrangement of parts may be altered without departing from the spirit of my invention.

Having thus described my invention, I claim—

1. The herein-described automatic speed-regulator for governors, comprising a longitudinally-slidable disk turning with the governor-shaft, a train from the motor for driving said shaft, and a lever whose two arms lie opposite respectively to said disk and to an intermediate member of said train, said lever being so mounted that the longitudinal movement of said disk causes said lever to bear against both said disk and said intermediate member, substantially as described.

2. The herein-described automatic speed-regulator for governors, comprising a longitudinally-slidable disk turning with the governor-shaft, a train from the motor for driving said shaft, and a lever whose two arms lie opposite respectively to said disk and to an

intermediate member of said train, said lever being so mounted that the longitudinal movement of said disk causes said lever to bear against both said disk and said intermediate member, in combination with means for forcing said lever down to lock said disk and intermediate member, substantially as described.

3. In a governor for motors, the combination of a lever having a friction-pad at each end, a device for transmitting motion to the revoluble shaft of the governor, the longitudinally-slidable disk turning with said shaft and operating by its longitudinal movement to bear against the end of the longer arm of said lever and thereby force the end of the shorter arm thereof against said motion-transmitting device, substantially as described.

4. In combination with the friction-disk of a governor, and the gear-wheel driving the same, the lever carrying at its end a second lever adapted to bear against said disk and wheel respectively, and a third lever adapted to force said first lever down and thereby cause said second lever to lock said disk and gear, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

M. A. FOGO,

A. B. KEOUGH.



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